October 1932

TECHNOLOGY REVIEW



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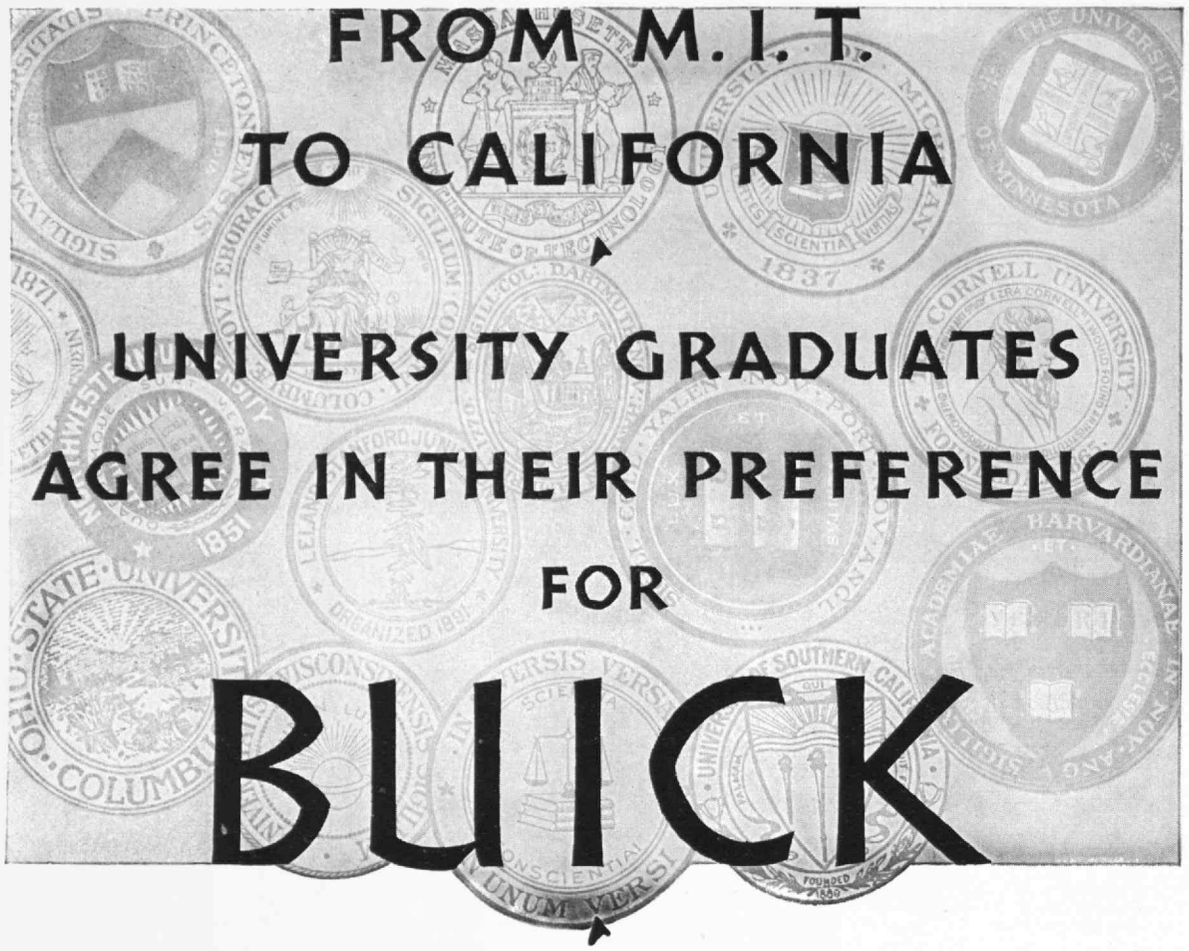
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* *The Graduate Group, Inc., certifies the accuracy of these facts about the ownership of Buicks among 15 leading colleges and universities.*

STRAIGHT **BUICK** EIGHTS

WHEN BETTER AUTOMOBILES ARE BUILT, BUICK WILL BUILD THEM . . . PRODUCT OF GENERAL MOTORS WITH BODY BY FISHER

THE TABULAR VIEW

THE judicious appraisal of television which opens this issue of The Review comes to us from J. WARREN HORTON, Chief Engineer of the General Radio Company. Before coming to Cambridge, Mr. Horton spent 12 years in the Bell Telephone Laboratories on carrier telegraphy and telephony problems, on precision frequency measurements, and on television development. After graduating from M. I. T. in Electrochemistry in 1914, he remained for two years more as a staff member of the Department of Physics. During the War he was engaged in problems relating to submarine detection, both in this country and at the U. S. Naval Headquarters in London. ¶ Dr. J. C. BOYCE is a Research Associate in the Institute's Department of Physics where he is working in the field of spectroscopy in association with President Compton.

AS A PARTNER in the Boston firm of Arthur L. Nelson, Engineers, EDWARD H. CAMERON is a consultant on power problems for public utility and industrial companies. A graduate in Civil Engineering from M. I. T. in 1913, he has had broad experience in contracting, in engineering work for the U. S. Navy, and in the engineering management of various enterprises. In 1931 he was President of the Northeastern Section of the American Society of Civil Engineers, and at present he is a Director of the Emergency Planning and Research Bureau, Inc., of Boston. In 1928 he was awarded the Clemens Herschel Prize for a paper entitled "Engineering Features of a Modern Glass Bottle Plant." ¶ For 20 years THOMAS D. PERRY, '00, has devoted himself to woodworking engineering, and at the present time he is Chief Engineer of the United Plywood Corporation as well as Works Manager and Engineer for the New Albany Veneering Company (Indiana). He has been President of the Plywood Manufacturers Association, Chairman of the Forest Products Section of the A. S. M. E., a member of the National Committee on Wood Utilization, and Chairman of the Executive Committee of the Wood Industries Division of the A. S. M. E. He is the author of the technical section of "Veneers and Plywood," editor of the woodworking department of "Collier's Encyclopedia," and a contributor to "American Industrial Biographies."

NOTABLE among the articles in the forthcoming issue of The Review is a discussion of domestic air conditioning by Walter L. Fleisher. The article cuts behind current ballyhoo on cooling and humidifying by presenting a discriminating engineering comparison of various systems together with data on their installation costs and operating expenses. ¶ Readers of this issue will note the large percentage of space devoted to charting the course of engineering accomplishments and progress. In coming months, projects that loom on the horizon will diligently be spied out and reported upon, and appraisals of current scientific and engineering developments, prepared by high authorities, will be presented.



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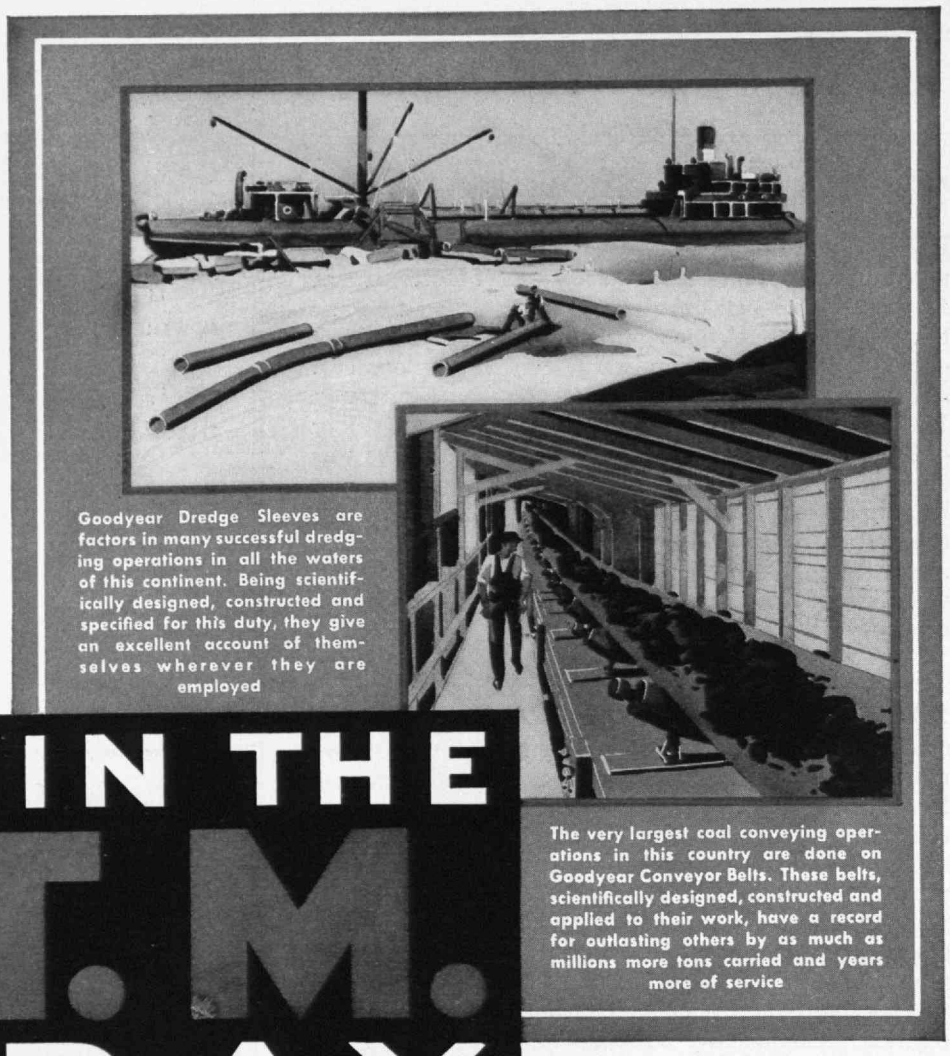
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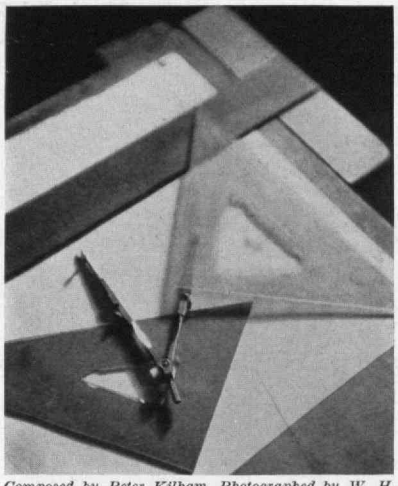
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THE TECHNOLOGY REVIEW

A NATIONAL JOURNAL DEVOTED TO SCIENCE, ENGINEERING, AND THE PRACTICAL ARTS

Edited at the Massachusetts Institute of Technology

VOLUME 35 NUMBER 1

Contents for October, 1932

THE COVER *From a photograph* BY WILLIAM RITTASE

HOOVER DAM DIVERSION TUNNELS FRONTISPIECE 4
Paving a Detour for the Colorado River

LOOKING 'ROUND THE CORNER BY J. WARREN HORTON 5
Television Still Faces the Pocket-Book Test

ECLIPSE — 1932 STYLE BY J. C. BOYCE 9
What It Meant to Science

OPPORTUNITIES ALONG THE ENGINEERING FRONTIER
Employment in the Engineering Profession BY EDWARD H. CAMERON 12
Engineers for the Woodworking Industry BY THOMAS D. PERRY 13

THE TABULAR VIEW 1
Notes on Contributors and Contributions

THE TREND OF AFFAIRS 16
The Past Month in Science and Engineering

THE INSTITUTE GAZETTE 24
Relating to the Massachusetts Institute of Technology

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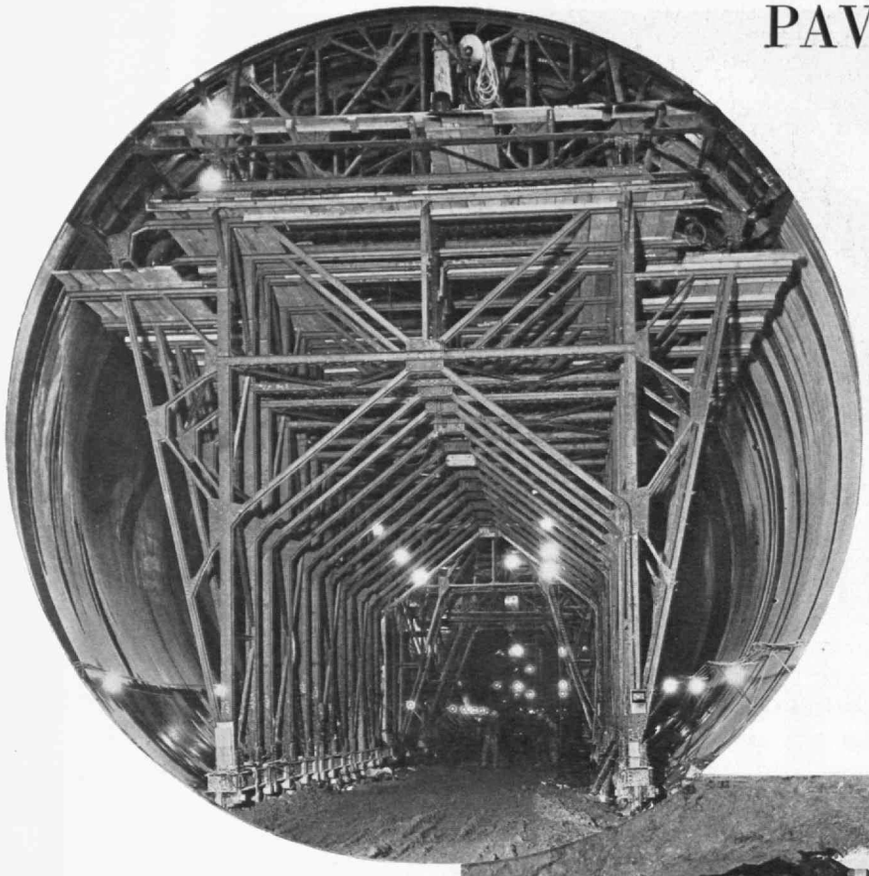
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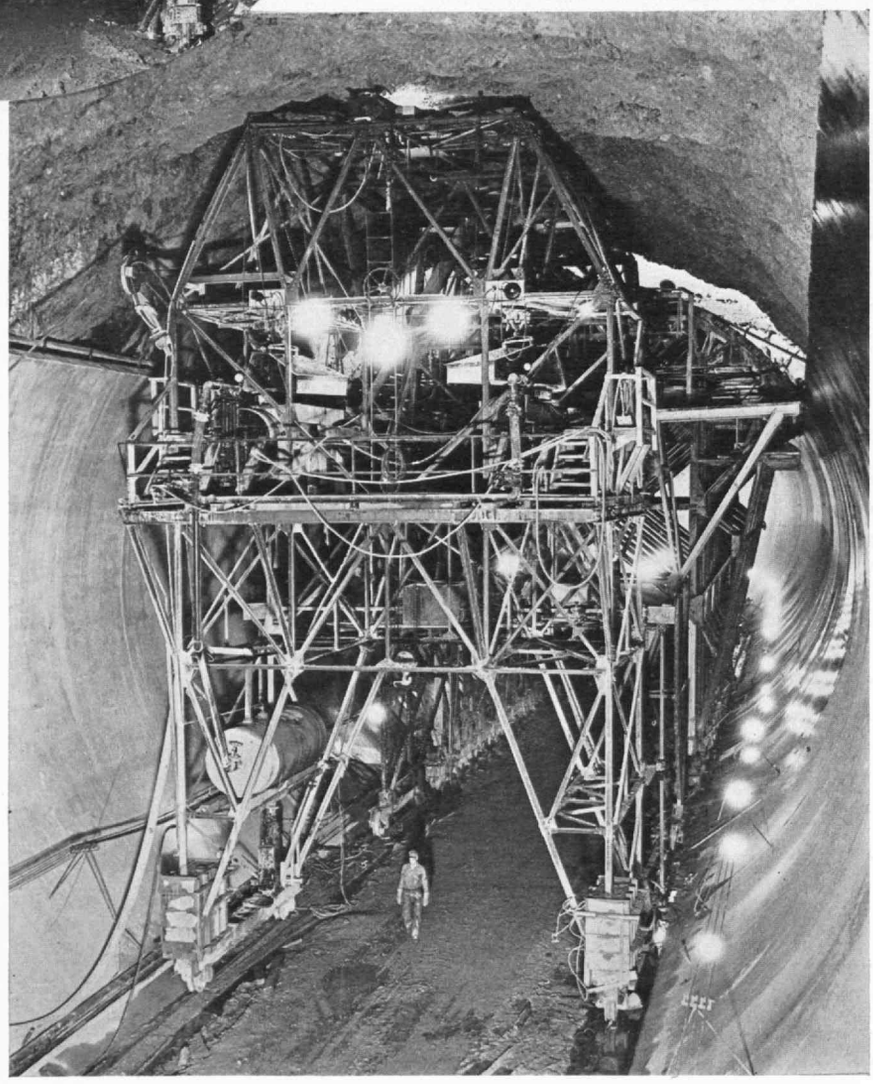
COLORADO RIVER

Lining the Huge Diversion Tunnels at Hoover Dam with Concrete

See page 17

Photos by courtesy of the U. S. Bureau of Reclamation





Above: Steel-frame carriage supporting form for 110° top-arch concrete in diversion tunnel lining. The surface of the top concrete is painted with an asphaltic coating immediately upon the removal of the form to prevent a too rapid dissipation of the concrete's moisture content

Right: Concrete gun carriage used in placing 110° top-arch concrete in diversion tunnels. Concrete is hauled by truck in dump-buckets into position under carriage, hoisted to upper deck by bridge crane operated overhead, dumped into hoppers, and compelled into forms by compressed air through two eight-inch steel and rubber pipes

The combined length of the four 56-foot diversion tunnels totals 16,000 feet and the rock which had to be broken and removed amounted to a million and a half cubic yards — a volume matching that of the world's longest railroad and water tunnels. Only a little more than a year was required for this gigantic task

THE
TECHNOLOGY
REVIEW

Vol. 35, No. 1 October, 1932

Looking 'Round the Corner

Television Still Faces the Pocket-Book Test

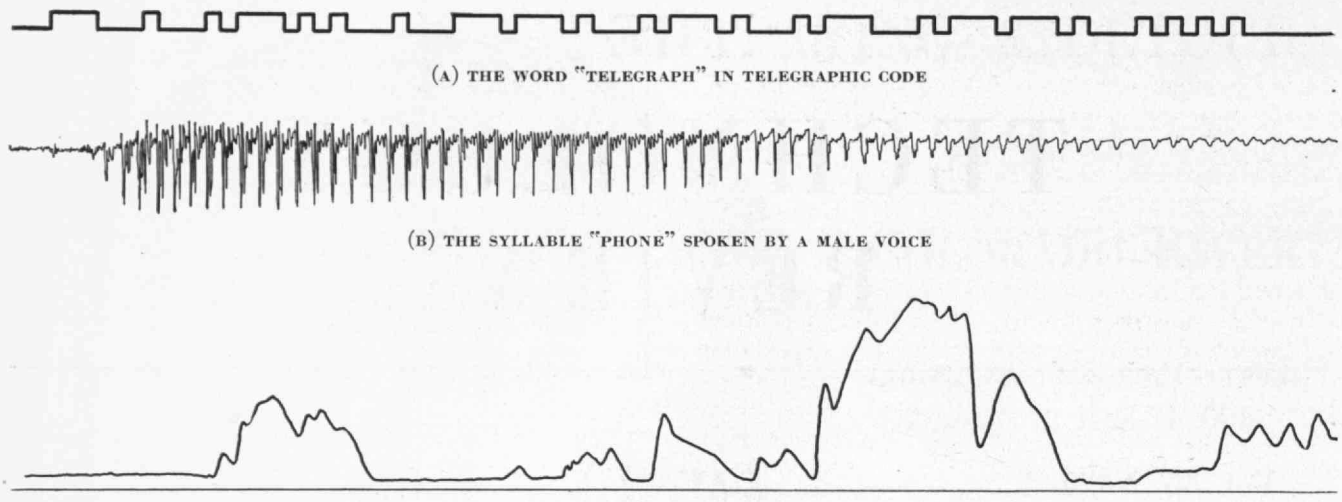
By J. Warren Horton

An Engineer, Confronting Rosy Prophecy with Sober Fact, Refutes a Chinese Philosopher by Demonstrating that a Picture is Not Worth a Thousand Words

TELEVISION has a peculiar significance in the progress of the machine age, not because of any grandeur of its technical achievement or because of its contribution to human well being, but because it marks the final defeat of the skeptic. It seems probable that this most recent accomplishment of electrical communication has rung down the curtain on that scornful chorus which has chanted the refrain, "It can't be done," at the approach of each new application of science since the steam engine, if not since the wheel and the lever. For perhaps the first time in history the public has foreseen an invention in advance of its realization, and, encouraged by the results, has replaced its old pessimism by a too abundant optimism. The technically sophisticated, however, will do well to temper their scorn; they are merely reaping their own whirlwind.

When our grandfathers predicted the ignominious failure of any attempt at heavier-than-air flight, their judgment was supported by some fairly extensive data as to the difficulty of getting ponderous matter to remain long away from substantial support. It is true that they lacked much of the quantitative information necessary for a complete solution of the problem, but within certain limits they had a working knowledge of the everyday manifestations of matter and energy on which we have improved but little. At all events, when confronted by the suggested possibility of the railway, of steam navigation, or of aviation they were able, on the basis of their own experience, to estimate the difficulties which had to be overcome. Today the subdivisions of knowledge are so complex that only a few specialists are in a position to evaluate the magnitude of any projected enterprise; the experience of the remainder of us suggests that, as the seemingly impossible so frequently comes to pass, we may confidently expect anything to happen. While it is true that we may without shame leave the slide rule work to those best qualified to manage it, we all become involved when the time arrives to apply the last quantitative measure — the universal measure of cost. It may be sufficient for the research scientist to confine his attention to concepts such as the laws of motion and of thermodynamics; the engineer, however, must govern himself in accordance with the laws of supply and demand as well. We may all have a more or less casual interest in how television has been brought about, but as members of the consuming public we have a very real concern in those factors which are of economic rather than of technical importance.

We are told that "television is just around the corner." As a matter of fact it definitely turned the corner of physical reality on April 7, 1927 when Herbert Hoover, then Secretary of Commerce, addressed an audience of over 700 publicists, seated in an auditorium



(A) THE WORD "TELEGRAPH" IN TELEGRAPHIC CODE

(B) THE SYLLABLE "PHONE" SPOKEN BY A MALE VOICE

(C) A SINGLE SCANNED LINE OF THE PHOTOGRAPH REPRODUCED ON THE OPPOSITE PAGE. THE LINE REPRESENTS 1/700TH OF THE COMPLETE PICTURE

FIGURE I

Records of the waves occurring in electrical communication systems. These waves have characteristics identifying them with the information they convey

in New York City, by means of long distance telephone and television circuits from Washington. The corner which remains is that where the value and the cost of obtainable performance meet. We may, perhaps, look speculatively around this corner by comparing television with other and more familiar forms of electrical communication systems, the economics of which have long since been brought within the fold of exact knowledge. Let us, therefore, examine some of these systems to determine *what* and *how much* they do.

Obviously the purpose of any electrical communication system is to transmit information, and information is an intangible sort of thing which at first glance does not appear to be susceptible of quantitative measurement. True, the Chinese have long maintained that "one picture is worth a thousand words," and the advertising profession has gone on record as sponsoring this comparative measure. It may be surprising to many to learn that the technique of electrical communication has evolved a method for reducing totally different forms of information to common terms whereby they may be compared rigorously, thus affording a means of confirming or disproving the Chinese proverb and of estimating the magnitude of the task confronting our contemplated television system.

There is no likelihood of attaching to our present telephone instrument some simple gadget which will exhibit before us an image of the person at the other end of the line. Not only is the circuit connecting us with the central office already loaded to capacity with the speech transmission, but it fails by a factor of at least ten of having the information-carrying capacity needed for even the crudest form of television image. Nor can we forget the fact, in considering communication between two individuals, that while in telephony we are willing to take turns in consigning our aural messages to the electrical channel, it is doubtful if we should be willing to take turns in looking at each other.

ELECTRICAL communication systems have come into being as a result of the possibility of transmitting an electric current over incredibly long distances in incredibly short intervals of time. This is true both in wire communication and in radio, except that in the latter case we generally speak of an electric wave instead of an electric current. The problem breaks down into three major parts: first, to impart to an electric wave characteristics identifying it with the information to be conveyed; second, to transmit this wave without too serious impairment of these identifying characteristics; and third, to reproduce, under the control of the received wave, a replica of the original form of the information. It is through the translation of various forms of information into a form suitable for representation by an electric wave that we find our desired basis for comparison.

These concepts are nowhere more strikingly exemplified than in the work of Morse. In a eulogy to Morse, written for the recently celebrated centenary of his birth, President Hoover referred with characteristic engineering precision to the invention of the telegraph code — not to the invention of the telegraph. The mechanism for the telegraph had been in existence some little time before it was used for the conveyance of information; in fact it could not be used for this purpose until the invention of a system of symbols corresponding to the letters of the alphabet and having characteristics which might be shared by an electric current. In recognition of the fact that an electric current can have but one intensity at a given instant, but can change from one intensity to another under suitable control, Morse devised what is nothing more nor less than a system of writing in which the inscribed line (see Fig. 1 — curve A) has never more than one vertical height for each horizontal position. It is, in other words, what our mathematical friends call a single-valued function. The succession of values represented by the height of this line, as it is scanned from

left to right, may be represented by a concurrent succession of values for the intensity of an electric current. To one familiar with this code a message may be read equally well by inspecting the inscription or by observing, with a suitable instrument, the variations in the intensity of the electric current.

The history of the telephone is almost the reverse of that of the telegraph. The phenomenon of sound is naturally of a form which may be described adequately in terms of a succession of values of air pressure, hence it may be identified readily with an electric current by causing the latter to pass through a corresponding succession of values of intensity. Here the problem was to obtain the means, rather than the method. The microphone permits us to control the intensity of an electric current in such a way that changes in its intensity duplicate in form concurrent changes in pressure of the air wave comprising some given sound. By transmitting this current to the distant end of a line it may there be made to control the operation of an electro-acoustic mechanism which emits a new sound wave having a sequence of pressure variations resembling that of the original sound. This recreation of a replica of the information which existed at the transmitting end of the line is the basis on which all electrical communication systems operate. The fidelity with which the reproduction duplicates the original is a measure of the performance of the system.

And now we find ourselves confronted with the problem of transmitting visual information. Let us proceed at once with the first step; namely, that of identifying the information with the electric wave. Apparently some ingenuity is to be called into play if we are to find a characteristic which is shared by a picture — or image — and by an electric wave. Let us regard a picture as made up of elementary areas of such dimensions that, as far as our interest goes, each may be considered as being of uniform tone value throughout. We then find that the required time sequence of values is easily obtained by scanning the picture in some convenient manner such that, in due course, we note in sequence the tone value — either reflecting power or opacity — of each elementary area of which it is composed. As the picture is scanned the succession of tone values encountered may, by a suitable optical system and photoelectric cell, so control an electric current that its intensity passes through a similar succession of values; the current intensity at any instant corresponding to the light intensity of the elementary area at that instant under scrutiny.

When, we are told that shortly we shall be able to buy a simple addition to our present broadcast receiver, by the use of which we shall see everything that is taking place in the studio, we must remember, first, that each of the present broadcast channels is already working at maximum capacity to bring us the audible information and, second, that the television signal which could be transmitted by the best present broadcast channel would produce an image having so little detail as to be practically valueless. It would appear from an inspection of the relative message-carrying capacities of various channels that the logical vehicle for television images is to be found in the short-wave transmission.

Thus, briefly, is the first basic part of the problem solved. Interesting as are the details of how scanning systems actually effect the desired conversion of pictured information into a form acceptable for transmission, and worthy as is the photoelectric cell of more than casual mention, we must be mindful of the editorial frown and confine our attention to the matter in hand — that of finding out how big a job this transmission of visual information really is as compared to telephony or to telegraphy. Assuming, then, that having translated a picture into the language of the electrical engineer a way will somehow be provided for retranslating it into the language of the photographer let us return to the electric waves which we have been at such pains to secure and see how those of one system compare with those of another.

In the normal utilization of electric signal waves the effects which they produce in the receiving apparatus are as diverse as the forms of information being transmitted, varying all the way from a typed page to an orchestral symphony. To the uninitiated these effects give little clue to the nature of the electric currents producing them. In his studies of the nature and behavior of electric waves the engineer uses a device known as the oscillograph which traces, point by point, the succession of intensity values through which a wave may pass. Although by no means indispensable to our comparison of the various methods of transmission it will be interesting, perhaps, and possibly helpful, to pause for a moment and examine the results of a few observations made by one of these instruments. The traces in Fig. 1 were obtained by photographing a spot of light, the vertical displacement of which corresponded at each instant to the amplitude of the electric wave under investigation. By moving the recording film, horizontally

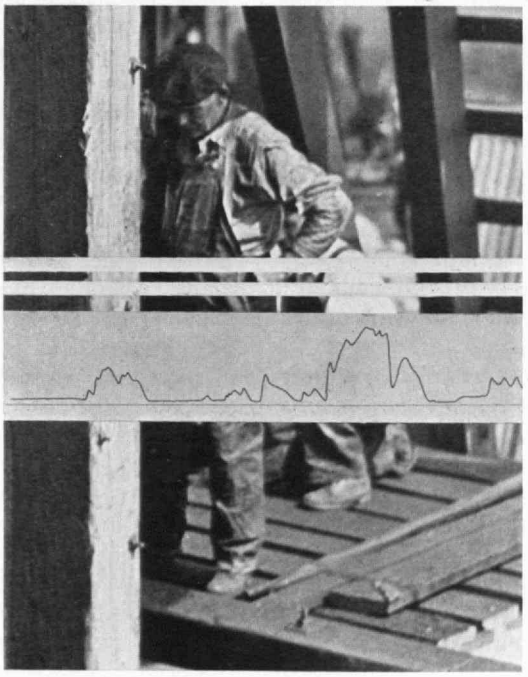


FIGURE II

The narrow strip between the two white lines on the above picture, when scanned for transmission, imparts to an electrical current a variation in intensity represented by the wavy line superimposed on the picture and shown enlarged on the opposite page (Fig. I–C). Note the humps in the line representing the light areas of the strip of picture

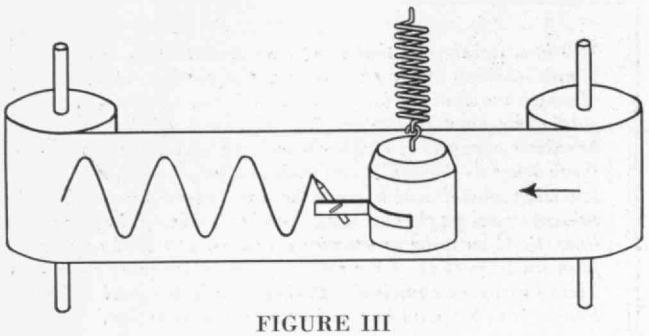


FIGURE III

The wavy line produced by recording on a moving tape the movement of an oscillating weight. Compare the simple harmonic wave produced with the records of Figure I, Page 6

at a uniform rate behind the lens, the relation between the current amplitude and time has been indicated.

It is, of course, a simple matter to confirm the findings of the oscillograph with respect to the telegraphic signals. In fact, the oscillograph might well serve as the ideal telegraph receiver. In the case of telephony, however, there is little in common between the visual record of the current changes and the impression made upon our ears by the corresponding changes in air pressure. We shall, therefore, have to accept the assurance of the acoustical engineer as to the validity of these data. With the picture signal we may confirm the report of the oscillograph by visual comparison, as in Fig. 2.

With these illustrations of characteristic current variations in mind we may proceed with a more significant comparison of the several waves. In order to analyze quantitatively the complex sequence of values assumed by the electric waves with which he has to deal the engineer resolves each into elementary components known as harmonic waves. These are of the simplest type of wave occurring in nature, such as is familiarly exhibited by the motion of a pendulum or of a weight suspended by a spring. If we observe the variations in height of such a weight and plot them, as in Fig. 3, against time, we obtain a trace of this elementary harmonic wave for comparison with the more complex waves previously recorded by the oscillograph. Waves having this form are found frequently in telephony; they correspond to what the musician knows as pure tones. More commonly the sounds which actuate the microphone are far from pure tones; regardless of their complexity, however, they may be considered in every case as combinations of pure tones.

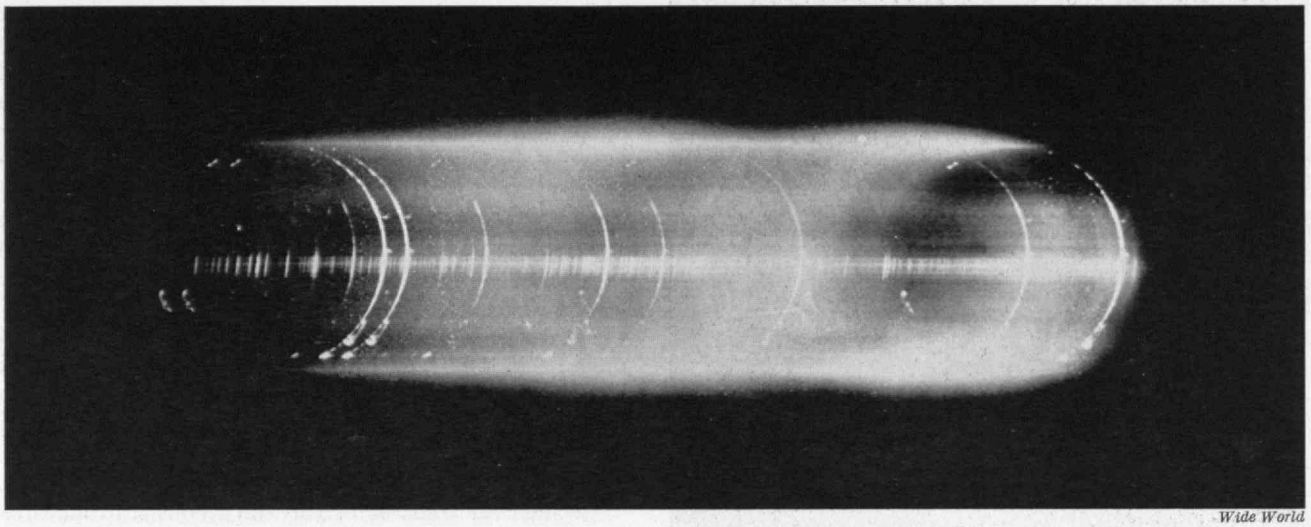
The important characteristic of a harmonic wave is the rate at which it passes through its recurrent cycles. This may be expressed as the frequency of recurrence, or, numerically, as the number of cycles occurring each second. Certain electrical and mechanical systems are capable of responding only to harmonic waves of a single frequency. Indeed this is generally true of the simpler forms of these systems. While this characteristic is of great value in affording a means for isolating the individual components of a signal wave for analysis, systems possessing it are obviously quite unsuited to the transmission of these waves as, in order to retain their pertinent characteristics, it is necessary to preserve each component impartially. In view of the fact that all electrical systems are definitely limited with respect to the frequencies of the harmonic components for which they exhibit uniform efficiency, and also of the fact that any increase in the range of frequencies so covered is obtainable only at a price, it would appear that the solution of our problem is to be found by examining the relation between the amount of information associated with a given wave and the range of frequencies occupied by the harmonic components of which it is composed.

In order to reduce some definite amount of information to a tangible and fixed form let us assume that certain spoken words are recorded phonographically. This serves both to translate the information into the form of a wave trace, and to inscribe it permanently in a form which will preserve its identity throughout any experiments which may be made with it. If, now, this record be driven at normal speed and the wave converted into the electrical form by an electro-mechanical device the resulting electrical wave may be analyzed by suitable selective circuits, isolating each of the harmonic components in turn. As might be expected these are found to agree, item for item, with the constituent pure tones forming the original sound. It is observed that the frequencies of these components fall within a region to the limits of which may be assigned definite maximum and minimum frequency values. Let us repeat the experiment, this time driving the record at twice its normal speed. An analysis of the resulting wave merely confirms what our intuition has already told us; the frequency of each individual component has been likewise doubled. Inasmuch as this applies to the frequencies terminating the region occupied by the entire group it is evident that the numerical extent of the frequency range has also been doubled. We need experiment no more, for we are now assured that, vary the speed of the record how we will, the range covered by the harmonic components, expressed as the numerical difference between the highest frequency and the lowest, will always be found to be strictly proportional to the speed. And so, remembering that the total information is identically the same in each case, and hence that the speed is a direct measure of the rate at which it is transmitted, we arrive at a fundamental theorem of electrical communication, namely: (*I*) *The rate at which information is transmitted over a wave communication system is directly proportional to the extent of the frequency range occupied by the harmonic components of the signal wave.*

From this it is but a short step to the useful corollary theorem: (*II*) *The product of the frequency range occupied by the harmonic components of a signal wave and the time required for its transmission is a numerical measure of the amount of information contained therein.**

THESE two theorems furnish a basis for comparing the burdens imposed on various types of electrical communication systems. The second theorem, for example, permits a quantitative index value to be assigned to any given amount of information, whether sound or image; the first relates the rate at which this information may be (*Continued on page 28*)

* A formal mathematical dissertation on these theorems was presented by Mr. R. V. L. Hartley, of Bell Laboratories, at the Volta Centenary held in Geneva in September, 1927.



Wide World

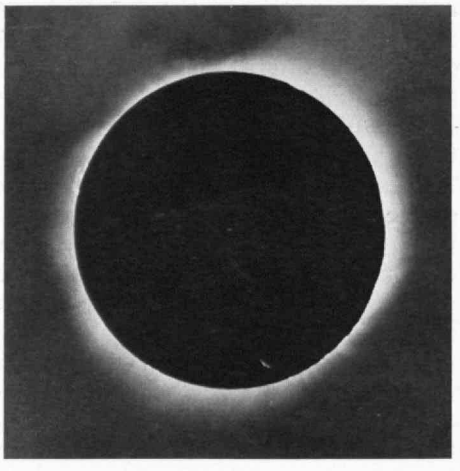
A flash spectrum time-exposure made during the recent eclipse by the Kyoto Imperial University Expedition at Alfred, Maine. The violet end of the spectrum is at the left, the red at the right. The photograph of the inner corona shown below was taken by the same group

ECLIPSE—1932 STYLE

What It Meant to Science

By J. C. Boyce

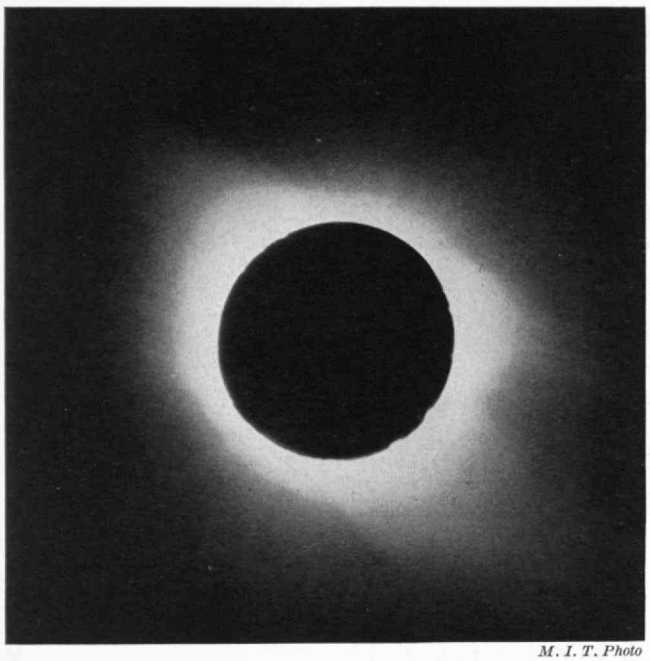
A CONTEMPORARY writer has asserted that the recent total solar eclipse in New England occasioned a population movement and change in daily life within the zone comparable in modern life only to the Eucharistic Congresses in the West and the pilgrimages to Mecca and Medina in the East. Whether such an estimate is accurate or not, it is certain that this eclipse evoked more popular interest than any preceding one. The skillful advertising of the hotels, booster organizations, and transportation agencies had, of course, its share in promoting interest, but other factors undoubtedly contributing were the recent memory of the eclipse of 1925, the pleasant vacation land where the shadow was to pass, its nearness to population centers, and the fact that the long range (statistical) weather forecast was favorable. The shorter range and unfavorable forecast, though discouraging, did not prevent the pilgrimage, and while a clear sky was present over only a part of the path, this was the portion most densely filled by watchers. Those further north missed a clear view but were partially rewarded by unusual color effects in the clouds.



Much has been written of the eclipse as a spectacle, but it may not be out of place briefly to consider the contributions that the study of solar eclipses have made to astronomy, to physics, and to chemistry. Perhaps the most outstanding result of the observations made at eclipses was the well-known discovery, a half century ago, of helium.

The fact of prediction is, of course, an achievement of science and many fascinating accounts have been written of the history of early astronomy. All give, as a warning to modern astronomers, the account of Hsi and Ho, the Chinese royal astronomers who were hanged on the occasion of the eclipse of the sun on October 22, 2137 B.C. Some say they met their death for an error in their prediction, but others attribute their fate to the fact that they were so drunk at the time as to be unable to perform the magical rites necessary to restore the sun to its rightful place in the sky.

Accounts of eclipses in historical documents have been most useful in checking or revising chronologies. The Chaldeans knew the periodicity of the recurrence of eclipses, but accurately to predict the location on the earth of the path of the moon's shadow requires a precision of observation and a refinement of calculation only recently obtained. An early American expedition, in 1780, missed the path of totality entirely because of the inaccuracy of the prediction of the path. Now, the location of its edge can be predicted within the distance of two or three city blocks, and its time of arrival within as many seconds. The recent refinements in lunar orbit theory have even yet failed to explain some of the erratic features of the moon's motion, but at least eclipse



M. I. T. Photo

Corona photographs on this page and the next taken on Cape Cod by the staff of M. I. T.'s Round Hill (Mass.) Research Station

expeditions now can rely on the prediction, so that they need have no fear of missing the phenomenon, provided they are given enough clear sky to see it.

The present reliability of prediction removes the interest from such calculations and modern investigations have shifted to the study of such solar phenomena as can only be observed at the time of a total eclipse of the sun. That we can learn at such a time more about the sun than when it is shining with full splendor, seems paradoxical. The explanation lies in the scattering of sunlight by the earth's atmosphere. If an astronomer were able to take his instruments to the moon and live there without our atmosphere for several days, he could observe at leisure the corona and flash spectra for which on the earth he must be content with the rare seconds of totality.

The flash spectrum, as will be seen later, comes from a very thin layer surrounding the sun, from a region which supplies perhaps less than a ten-thousandth of the total sunlight ordinarily reaching the earth. When the details of this spectrum are considered in a later paragraph it will be easy to see why an admixture of ordinary sunlight will at once make the observation difficult or impossible. However, at total eclipses the moon prevents the ordinary sunlight from reaching our atmosphere in the path of totality. The light from the layer at the sun's edge does reach our atmosphere, and while, of course, it undergoes scattering, it does not then suffer from the admixture of the much brighter scattered sunlight. Considerations of the same kind apply to the observation of the corona.

Readers of The Review will recall an article in the April, 1932, issue by Professor H. N. Russell of Princeton entitled "The Master Key of Science" in which he discussed the history of spectroscopy and its application to astronomy. He showed how the spectroscope had made possible a chemical analysis of the most distant stars, giving information about them which a philosopher had once asserted must always remain unknown and unknowable. The brief introduction to spectroscopy given in Professor Russell's article will be assumed as a "prerequisite" to what is to follow here.

The light of the sun as ordinarily seen comes from a layer of incandescent gas known as the photosphere. Above this, a layer of cooler and less dense gas, known as the chromosphere, or reversing layer, absorbs certain wave lengths from the continuous spectrum of the photosphere. The characteristic spectrum of sunlight — to the eye a continuous band of color from the violet to the red — is broken by a larger number of very fine dark lines. These lines were first charted in any detail by Fraunhofer and now bear his name. A study of these lines reveals the strongest absorption as due to hydrogen, calcium, sodium, and iron. A long list of other elements, mostly metals, have been identified.

In such an analysis of the sun's constitution, three facts must always be kept in mind. First, absorption effects of the earth's own atmosphere must be taken into account. This is easily done by comparing solar spectra taken when the sun is high in the sky with others taken when it is near the horizon. In the latter case, the light traverses the earth's atmosphere for a longer distance and any absorption lines more intense in it are obviously due to effects of the earth's atmosphere. Second, elements may be present in the sun and yet not be detected in the Fraunhofer spectrum, if, in their normal state, they give no absorption lines in the region of the spectrum to which the earth's atmosphere is transparent, or if the energy to raise such atoms to excited states where they might be able to absorb observable wave lengths is so great that no appreciable fraction of them is present in that state at the temperatures of the solar reversing layer.

The reverse effect also may enter. Atoms (or molecules) which in their normal state would give absorption lines (or bands) in an accessible region of the spectrum may at solar temperatures be so nearly all raised to an excited or ionized state (or dissociated) that not enough remain in the normal state to give the expected lines. A systematic treatment of solar and stellar spectra in terms of physical chemical laws has been worked out by Saha, and gives a reasonable explanation of the difference between the spectrum of the sun's disk and the slightly cooler region of sun spots.

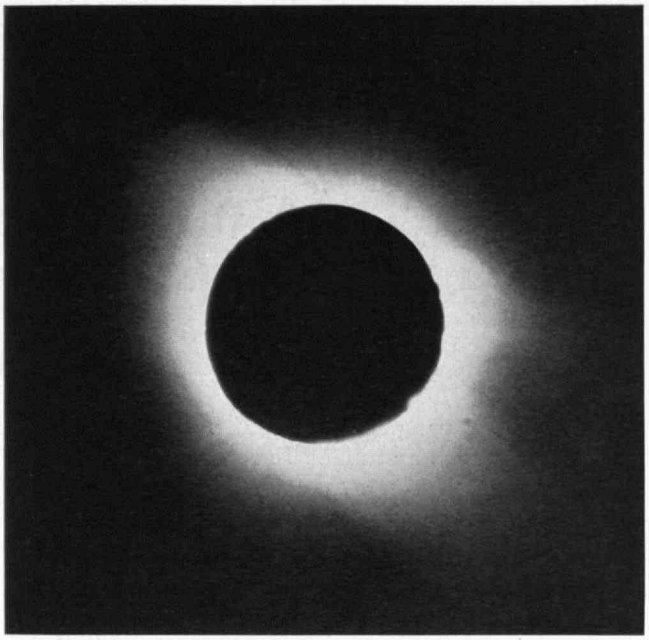
Third, the materials of the reversing layer (and these consist entirely of materials abundant on the earth) may then be analyzed, but no indication is given of whether they lie all mixed up together in a fairly homogeneous reversing layer or whether there is some stratification, the lighter elements being found in the higher portions of the reversing layer. C. A. Young first recognized this question and proposed the solution, making the first observation at the eclipse of 1870 of what is now known as the flash spectrum. If a brighter source, such as an arc light, is viewed through a sodium flame, the spectrum of the arc is seen furrowed by the strong absorption lines in the yellow due to sodium. Yet the same sodium flame viewed (simultaneously, if desired) sideways so as not to include the light of the arc gives just those same yellow lines in emission. Thus emission or absorption is largely a matter of

relative brightness. Professor Young therefore predicted that if the edge of the sun were observed, the lines commonly seen as absorption against the brighter photosphere would be seen as emission lines. At normal times, scattering by our own atmosphere makes it impossible to select only the light from the reversing layer, seen edgewise at the sun's limb. At eclipses, the moon provides the necessary screen and a short interval occurs at the beginning and end of totality when only the light from the reversing layer is seen. Spectroscopic observations then permit a study of stratification in the solar atmosphere and sometimes the detection of emission lines not ordinarily seen in the sun's absorption spectrum. Under just these circumstances the discovery of helium referred to above was made.

The corona, the most conspicuous feature of the total eclipse, is a glowing mass of gas extending outward from the sun for great distances. Pressures in the reversing layer approximate those of ordinary (not gas-filled) electric light bulbs, the absorption becoming evident because of the great depth (relative to laboratory dimensions) of this layer. The pressure in the corona on the other hand is probably less than that of the best vacuum ever obtained in a laboratory, but the still greater magnitude of the space filled by the corona conspires to make it visible. Photographing the corona is a difficult job, at least in interpretation, because the longer the exposure, the greater its apparent extent, and the eye is able to see the corona extending farther out from the sun than the short exposure photographs, using all the time available at an eclipse, are able to record. At recent eclipses, studies on the intensity distribution of light, its polarization, and its spectrum have been made by many observing parties.

The intensity studies show the rate at which the gas pressure probably changes at increasing distances from the sun, but gives very little idea of the actual numerical value of the pressure except that it is exceedingly low. Polarization studies show the extent to which the corona shines by its own light and how much it shines merely by reflected sunlight, both processes actually taking place.

The spectrum of the corona gives the usual absorption lines to be expected in the reflected sunlight and a number of emission lines due to its own light. Many of these are due to perfectly well-known light elements which might be expected to extend as an outer haze for large distances away from the sun. A few lines, one a particularly strong one in the green, remained which cannot be identified with any terrestrial source. These have, therefore, been ascribed to a hypothetical element called coronium. The spectra of nebulae contain other unknown lines called for the same reason nebullium. The characteristic feature of both is that they arise from regions where the pressure is exceedingly low and where the only known spectral lines accompanying them are of very light elements. It is, therefore, to be expected that the unknown lines in both cases arise from some light element or elements. No place remains for such in the periodic table of the elements, and all the most accepted theories of modern physics and chemistry would be seriously upset by the existence of another light element. Bowen therefore pointed out



a few years ago that the nebular lines were due not to unusual elements, but to usual elements shining under unusual circumstances, namely the exceedingly low pressure. There, atoms can travel for hours or even days, instead of for less than thousandths of a second, without undergoing the disturbance of a close collision with neighboring atoms. So they sometimes emit light by some transition from one atomic state to another which ordinarily is so improbable as to be described by physicists as a forbidden transition. The wave lengths to be emitted from such "forbidden transitions" can accurately be predicted from the ordinary spectrum of those elements and Bowen was able to identify a number of the unknown nebular lines as coming really from oxygen and nitrogen.

The corona also is a region of exceedingly low pressure and a similar explanation seems indicated. However, to prove such an explanation very accurate wave length measurements are necessary. An all night exposure to the light of a nebula will provide sufficient accuracy, but the very limited time available at total eclipses has only permitted wave length measurements with certainty to the nearest unit, whereas for identification purposes it should be known to tenths or better to hundredths of a unit. In spite of this, to extend Professor Russell's metaphor, it seems likely that the hypothetical element coronium will follow nebullium and "vanish into thin air."

Beside flash spectra and corona studies, recent eclipse observations usually have included photographs of the star field surrounding the sun and visible at that time. These photographs have been made to test the prediction of Einstein in the general theory of relativity that rays of light passing close to the sun are deflected by its gravitational field. The present writer does not feel competent to discuss the theory or even the observations, but most authorities agree that Einstein's prediction has been verified, at least qualitatively. The subject will not be dropped at future eclipses, but generally was omitted from the programs (*Concluded on page 36*)

Opportunities for Employment

I. The General Outlook

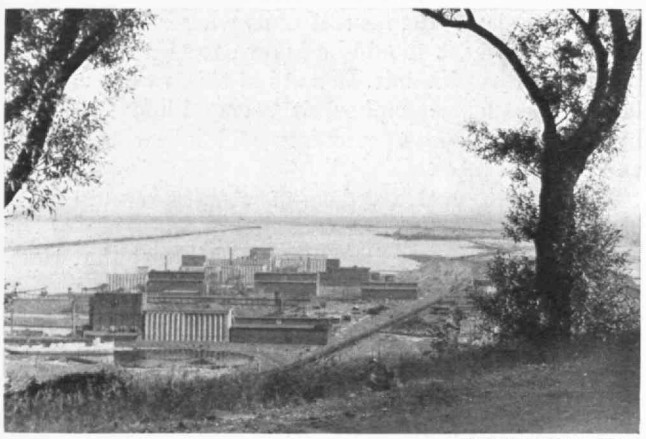
The Future of Employment in the Engineering Profession

EDWARD H. CAMERON

BUSINESS prospects are better. Deflation is accomplished, and many signs point to a gradual resumption of normal activities. Thus speak the oracles of the financial page. Oracular stock has had its own little bear market, passing from the peak of naïve credulity to the nadir of homicidal disbelief, and it now seems to be traversing a zone of cynical skepticism. We once read the financial column for profit, we thought; later, we grieved through its paragraphs along with similar necrological items; and now, we derive a chastened comfort from a review of its present more hopeful tinge. Our own reasoning faculties direct us to agree that its forecast is justified, and surely general business conditions are recovering from the despondency which set in so earnestly last winter and spring. In the light of this apparent recovery, what are the prospects of the engineer?

Opinions vary in the extreme. Some predict a modicum of engineering activity pending the digestion of a previous prosperity diet of over-construction in the plant and equipment elements of production. This school sees no immediate field for engineering talent other than a somewhat minor rôle of indicating and directing incidental economies of manufacture. Others profess to see engineering work keeping pace with the growth of general business activities and returning eventually to the scale of the 1920 decade.

Few business men can see any such rapid pace in recovery as that suggested by the phenomenal advance in security prices which is occurring as I write. The present state of the business mind anticipates, instead, a progress to recovery marked by frequent local reverses rather than by a general advance along the whole front.



Technology Review Photo

Duluth Harbor, "one of the finest in the world." As engineers advance their frontier, Duluth will ship more iron ore from the famed Misabe Range

Let me examine the prospects of the various major items of the construction field. With respect to national and local government construction, it would appear that the accelerated activity of the past year or two in public building, highway construction, and general public works will be adversely affected by the present ominous attitude of the taxpayer. It is, therefore, reasonable to expect a subnormal activity in such public construction for several years.

In normal times, private residence construction constitutes an important proportion of the total volume of building. As regards the future, there are two opposing conditions to consider. On the one hand, we note many idle residences and apartments often held by banks, either solvent or insolvent. On the other hand, we note statistics indicating that in many instances two or more families are living in quarters designed for one family. It seems obvious that a normal increase in population and the return of families to the condition of individual domiciles must first satisfy the present large vacancy factor before capital will again seek outlet in this field. Hence a subnormal volume of residential construction is to be anticipated, and similar reasoning places office building construction in the same category.

For major industries, such as paper, cement, and textiles, present buildings and plants appear to be of adequate capacity for some time. In the industries, in general, the forces of depreciation and obsolescence have proceeded practically unchecked for the past three years, and there is an undoubtedly large volume of replacement business in the offing. Few extensions, however, to manufacturing plants, other than such replacements, appear probable.

Town officials seem to have accepted Mr. Coolidge's statistics which place the greater proportion of tax increases since 1920 on local governments. If we may believe consulting engineers active in such branches as sanitation and water supply, much of the present "economy" will result in high deferred maintenance charges and premature replacements in the 1930's.

THERE is no doubt that similar ante-panic analyses are on record subsequent to 1837, 1857, 1873, and 1893, and that such records are of equally pessimistic tone as that of the above (*Concluded on page 33*)

along the Engineering Frontier

II. A Concrete Example

The Need for Engineers in the Woodworking Industry

By Thomas D. Perry

THE woodworking industry, like the steel industry, is divided into two major groups, each with its widely differing engineering opportunities. In steel we have, on the one hand, the blast furnace and rolling mill producing the semi-raw material, and on the other hand, the fabricator of steel products converting this material into the finished article, such as the automobile, ship, trestle, engine, or even the bolt, nail, or chain. In the lumber industry, the two groups are equally well defined. In the primary one, the logger and saw mill operator reduce the standing timber into commercial sizes of lumber; in the second, the woodworker converts the boards into furniture, doors, pianos, radios, coffins, box shooks, and the like. Dr. Wilson Compton, Secretary and Manager of the National Lumber Manufacturers Association, ably presented the opportunities for engineers in the primary lumber *producing* field in The Review for November, 1931. I wish to complete the picture by emphasizing the manifold opportunities for engineers in the secondary woodworking field.

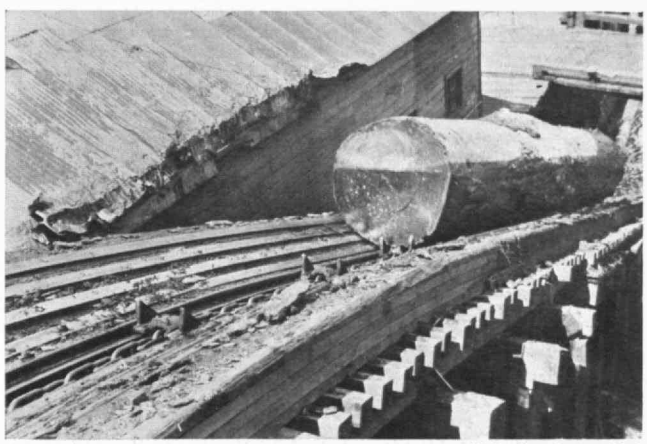
Is the magnitude of the woodworking industry sufficiently great to attract engineering talent? Recent census reports answer this question conclusively. Among the 16 major manufacturing industries in the United States, as given in the 1927 Census Tabulations, the entire woodworking industry ranks (see Table I) as follows *:

	Relative Standing
By Totals:	
Value of Manufactured Products	6
Number of Wage Earners	3
Number of Establishments	4
Amount of Wages	4
By Averages:	
Wage Earners per Establishment	10
Wages per Employee	15
Value Mfg. Product per Establishment	15
Value Mfg. Products per Wage Earner	15

A closer examination of the woodworking field (Table II) leads into a more detailed analysis of the annual lumber statistics. Thus in 1929 nearly 37 billion feet of lumber (boards, planks, and timbers) was produced, approximately half for structural purposes (no further processed than surfacing) and the remainder was converted by re-manufacture into a wide range of wood products, from matches to freight cars. The principal branches of re-manufacture are given in Table III, with the wood utilization segregated into soft woods and hard woods. The smallest industry indicated, i. e., dowels, used over 15 million feet or nearly one thousand carloads of lumber. The total utilization of nearly 19 billion feet amounts to nearly a billion carloads per year, or over 3,000 cars per day. The intricacy of the processes of re-manufacture vary from the simple turning of a dowel to the assembling of a concert grand piano, with its thousands of articulated wood parts, all of which must be accurately made and adjusted to the production of true artistic tones.

If the size and variety of an industry is any measure of engineering opportunity, then it is apparent that woodworking presents a vast field for the exercise of the talents of a trained engineer. It is a recognized fact, however, that the industry in proportion to its size has fewer engineers than any other. This paucity of technical ability leads one immediately to inquire why such a great industry as woodworking has had so little attention from higher technical institutions.

The principal reason is traceable to the relatively small size and local character of woodworking operations during the years when technical instruction was being developed. Other industries, such as iron and steel, transportation, electrical equipment, chemical products, power-light-water-gas service, and many others, were



Technology Review Photo

Douglas Fir Log being elevated from river by log haul chain. Once up, a huge iron arm (the "nigger") turns it to the proper position for the head saw

* Statistics throughout this article are derived from the United States Census tabulations, and are for adjacent years, as the rotating method of accumulating industrial data restricts the completeness of each year. The period of 1927–1929 is chosen to avoid the unusual effects of present business conditions.

TABLE I

GROUPS OF MANUFACTURING INDUSTRIES

U. S. Census for 1927

By Totals	*Number of Establishments*	*Wage Earners*	*Wages*	*Horse power*	*Value Products*
Food	49,787	679,520	$823,388	4,134,973	$11,015,860
Textile	26,843	1,694,416	1,759,958	4,173,438	8,950,473
Iron and Steel	6,346	835,501	1,264,406	8,323,037	6,199,252
Machinery	12,037	886,427	1,287,778	3,009,265	5,368,015
Transportation Equipment	2,537	494,905	803,298	2,027,686	4,693,972
Forest Products	20,163	862,667	929,790	3,321,755	3,457,427
Chemicals	7,541	253,436	317,908	1,848,309	3,351,892
Petroleum and Coal	1,418	141,655	217,485	1,513,314	3,060,226
Printing	25,416	327,534	584,766	568,427	2,846,078
Non Ferrous Metals	6,658	270,545	380,365	1,219,598	2,668,697
Leather	4,265	315,991	364,447	419,591	1,869,305
Paper	2,989	225,506	273,571	2,814,795	1,799,780
Stone, Clay, Glass, Etc.	8,673	350,017	464,273	2,709,131	1,612,549
Railway Repair Shops	2,309	428,672	648,908	1,110,821	1,289,695
Rubber	516	141,997	198,074	790,622	1,225,077
Miscellaneous	14,368	440,966	530,387	840,919	3,310,050
TOTALS	191,866	8,349,755	$10,848,802	38,825,681	$62,718,348

Wages and Product Values expressed in thousands of dollars (add 000).

By Averages	*"A"*	*"B"*	*"C"*	*"D"*	*"E"*
Food	13	$1,212	83	$221	$16.3
Textiles	63	1,038	156	334	5.3
Iron and Steel	139	1,514	1,311	978	7.4
Machinery	74	1,452	250	446	6.1
Transportation Equipment	198	1,623	798	1,850	9.5
Forest Products	43	1,078	165	172	4.0
Chemicals	34	1,254	246	445	13.1
Petroleum and Coal	100	1,537	1,069	2,160	21.6
Printing	13	1,784	22	112	8.7
Non Ferrous Metals	41	1,407	183	402	9.9
Leather	74	1,154	98	438	5.9
Paper	75	1,213	941	602	8.0
Stone, Clay, Glass, Etc.	40	1,325	312	186	4.6
Railroad Repair Shops	186	1,514	480	558	3.0
Rubber	275	1,395	1,529	2,375	8.6
Miscellaneous	31	1,200	59	231	7.5
GRAND AVERAGES	43	$1,299	202	$326	$7.5

"*A*" — Average number wage earners per establishment.
"*B*" — Average annual wages per individual wage earner.
"*C*" — Average horse power per establishment.
"*D*" — Average annual value of manufactured products per establishment in thousands of dollars (add 000).
"*E*" — Average annual value of manufactured product per wage earner in thousands of dollars (add 000).

necessarily large units, with magnificent and intriguing possibilities. Hence courses of study directed to their opportunities became popular, and every engineering graduate had several chances to enter these industries.

In the meantime, the woodworking industry has grown apace, largely un-engineered. It is now beginning to discover the manifold advantages of large units, of intensified research, and of duplicating the promotional activities of these other large but thoroughly engineered industries. This growth and awakening has created some outstanding problems — and problems are opportunities — of which only a few can be outlined here:

Problem 1. Wood decays, much as iron and steel rust. Alloys, developed by research, are leading the way to the ultimate elimination of rust. Wood preservation is an infant industry, practiced as yet principally by the users of ties, piles, poles, and bridge timbers. In the building construction field it is hardly recognized.

Problem 2. Wood burns easily, although it has excellent insulating qualities. Fire-resistant wood is in sight, but unburnable wood is scarcely a vision as yet.

Problem 3. Reinforced wood is almost an unknown term. Reinforced concrete welds together the tensile strength of steel with the compressive strength of concrete, within economic cost ranges. Plywood and laminated wood permits the distribution of wood strength and the counterbalancing of wood weakness in such a manner as to approximate the strength of steel on a pound for pound basis. Plywood fabrication has a substantial foothold in the furniture and musical instrument industry and is reaching out into the structural field, but its eventual possibilities in the near future are almost staggering.

Problem 4. The field construction of modern wooden buildings has scarcely been mechanized at all, while steel structures are well engineered. Already the large steel companies are zealously attacking the problem of steel and wood houses mechanically erected, thinking in terms of the steel-conscious mind, and scarcely recognizing the many outstanding structural advantages of wood.

Problem 5. The economic utilization of wood waste is a staggering problem. Competent authorities estimate that less than 50% of the standing tree in the forest, by most efficient processes, is converted into lumber; and that seldom does more than 50% of the board arrive in the finished product. An ultimate yield of only 25% to 30% in a major industry is a challenge to the engineering profession.

Problem 6. Synthetic woods are coming on the market, such as "Masonite," "Insulite," "Nu-Wood," and others. They excel wood in some respects and are distinctly deficient in others.

The proper development of these products and the relating of them to real wood is a major problem.

Problem 7. Wood shrinkage, during drying, is a baffling phenomenon, aggregating at least a 10% loss in bulk, and introducing many intricate problems of achieving fixity of dimension in wood products. Ten per cent of the lumber cut in 1929 (36,886,032 M) at its average value of $26.94 makes a total annual wastage of nearly 100 million dollars. Can it be wholly or partially neutralized or eliminated?

TABLE II

LUMBER PRODUCTION FOR 1929

Thousands of Feet

Soft Woods		
Yellow Pine	11,629,689	
Douglas Fir	8,688,700	
Western Yellow Pine	3,288,237	
Hemlock	2,098,668	
White Pine	1,247,878	
Others (Less than 1,000,000 each)	2,860,173	29,813,345
Hard Woods		
Oak	2,574,495	
Red Gum	1,103,703	
Maple	823,552	
Yellow Poplar	435,953	
Birch	374,377	
Tupelo	306,634	
Chestnut	267,917	
Others (Less than 250,000 each)	1,186,056	7,072,687
TOTAL		36,886,032

Problem 8. Wood finishing materials embody a chemical problem, but it is closely interwoven with wood technology. Great strides have recently been made in lacquers and varnishes and their economic mechanical application, but much remains to be accomplished.

Problem 9. Sawdust, including other machine shavings, is responsible for approximately a 20% loss. In the saw mill field an average kerf allowance is 3/16″ on a surface cut and in the re-manufacturing industries it is occasionally (but not often) as low as 1/16″ on an edge cut. The shaving loss, in thickness only, is frequently ¼″, not including width losses. The annual lumber value of this kerf is conservatively estimated as:

Saw Mill Operations	$218,714,712.29
Re-manufacturing Industries	24,816,182.99
Total	$243,530,895.28

How much of this can be retrieved is an engineering problem, to be solved partly by the woodworker and partly by the machine designer and maker.

IT IS one problem for a technical graduate to enter a well-developed field, starting at the bottom and gradually working up the rungs of the ladder, surrounded with many competitors. Many will struggle and not arrive, and at best, the field will be crowded, and professional mortality tragic for many.

It is an entirely different problem to enter a relatively un-engineered industry, to pit one's professional training and ambition against partial solutions of within-the-industry-trade-trained men. The struggle may be fully as intense, yet the crowding will be less, the problems more strategic, and the opportunities for advancement more frequent. By no means the least inducement is the need of the industry, all too frequently denied, for the same technical advancement that well-engineered industries have enjoyed.

A decision between the two is by no means easy to make, and family antecedents, environment, and individual choice deserve adequate consideration. So far, the decisions have been largely in the direction of the industries that bid fair to be over-engineered. Fulton, Marconi, Edison, Bell, du Pont, Eastman, and others of their pioneer spirit, ventured into under-engineered fields and won their laurels. They also rendered incalculable world-wide service.

The wood industries are age-old, but their demands for technical growth and development are insistent and their call imperative. Certainly they offer unlimited scope to the engineer, involving as they do all the manufacturing problems common to work in metal, paper, concrete, and various other materials.

The M. I. T. has been behind many outstanding industrial achievements, and the wood utilization field is ready for the harvest. There are opportunities without end for engineers trained to the problems of woodworking.

TABLE III

WOOD-USING INDUSTRIES BY PRODUCTS

U. S. Census for 1928

Per Thousand Board Feet Units

	Soft Woods	*Hard Woods*	*Foreign Woods*	*Total*
Planing Mill Products	4,104,869	957,629	1,085	5,063,583
Boxes and Crates	3,671,733	1,144,875	92	4,816,700
Sash, Doors and Millwork	2,785,918	515,527	15,901	3,317,346
Furniture	60,203	1,093,278	45,131	1,198,612
Car Construction and Repair	846,734	160,983	1,691	1,009,408
Motor Vehicles	109,258	757,673	944	867,875
Baskets and Fruit Packages	107,621	153,909		261,530
Chairs and Chair Stocks	2,008	161,022	2,362	165,392
Caskets and Coffins	93,795	60,780	1,533	156,108
Refrig's and Kitchen Cabinets	65,992	79,742	11	145,745
Agricultural Implements	78,976	63,959	8	142,943
Woodenware and Novelties	56,664	84,715	920	142,299
Fixtures	32,576	89,054	8,400	130,030
Ship and Boat Building	100,375	21,911	6,056	128,342
Handles	288	123,929	437	124,649
Matches	114,511	1,432		115,943
Musical Instruments	15,385	86,401	5,716	107,502
Non-Motor Vehicles	5,719	75,103	19	80,841
Electric Mach'y and Apparatus	46,545	19,865	340	66,750
Tanks and Silos	66,050	278		66,328
Boot and Shoe Findings	26	48,716		48,742
Signs and Supplies	46,909	1,688		48,597
Shuttles, Spools and Bobbins	1,097	42,925		44,022
Dairy, Poultry, Apiary Supplies	26,673	14,362		41,037
Pencils and Pen Holders	39,857	125		39,982
Machine Construction	35,094	4,465	68	39,627
Toys	12,336	26,917	157	39,410
Laundry Appliances	18,553	20,121		38,674
Cigar and Tobacco Boxes	6,319	25,166	6,944	38,429
Foundry Patterns and Flasks	25,982	2,383	1,631	29,996
Sporting and Athletic Goods	4,568	25,166	239	29,973
Brooms and Carpet Sweepers	18,365	9,817		28,452
Rollers, Shades and Maps	17,160	7,076		24,236
Trunks and Valises	11,349	9,997		21,346
Frames and Mouldings (Picture)	700	20,144	103	20,947
Brushes	593	16,415	25	17,033
Plumbers Woodwork	2	16,270	1	16,273
Movie and Theatrical Scenery	15,934	273	16	16,223
Scientific Instruments	5,208	9,289	1,013	15,510
Dowels	162	14,925		15,087
Other, less than 15,000	25,653	45,421	2,839	73,913
TOTALS	12,678,032	6,013,726	103,682	18,795,440

THE TREND OF AFFAIRS

IN THIS SECTION: *New Uses for Powdered Metal (16); Seventy-Five Miles of Welded Seams (17); Invention as an Antidote to Depression (18); Timing Races to 1/100ths of a Second (18); On a Rereading of Pliny (19); Flexible Concrete Pipe (20); Using Rubber to Prevent Corrosion (21); Stocktaking of Engineering Achievements (22)*

Metallic Sponge

TO powder a metal in order to reconsolidate the resultant into rods, bars, and tubes seems a waste of time and energy. The widespread use of metal powders as pigments in the making of paints and inks is a matter of common knowledge, and they have long had recognized places as reagents in certain of the chemical industries. But to compress and heat treat powdered chromium, iron, nickel, copper, silver, tin, zinc, molybdenum, or tungsten into solid shapes, or to mix the powders of these individual metals and then to compress and heat treat such mixtures to make synthetic alloys — these are comparatively new ideas, particularly when carried out on a commercial scale.

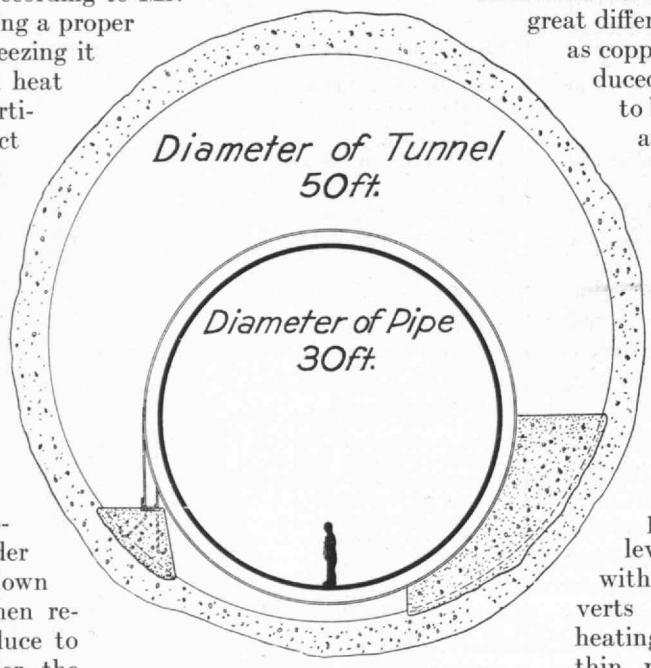
Although the finished products now possible are of limited size, Charles Hardy, writing in a recent number of *Metal Progress*, is authority for the statement that the consumption of powdered metal for synthetic alloying and the manufacture of pressed parts is now, to estimate conservatively, of the order of 100 tons a month.

In principle the method, according to Mr. Hardy, is simply one "of filling a proper mould with the powder, squeezing it so that it coheres, and then heat treating the pellet so the particles weld together at contact points. Metal powder for this purpose should consist of particles with rough surfaces to interlock while the forming pressure is on, and should also be free of oxide which would prevent the actual intergrowth or welding of the metal crystals where they touch." Particles with these properties are best obtained from the operation of an electrolytic refining process under such conditions as to "bring down a spongy deposit which, when removed and washed, will reduce to an impalpable powder under the gentlest rubbing. . . . By such methods . . . the fabricator is furnished metal of the highest purity in rough, angular fragments, with particle sizes either within close limits, or conforming to specified screen analysis between 100 and 500 mesh. Such metals are ready for compression, either as an individual metal, or as a controlled mixture of two or more."

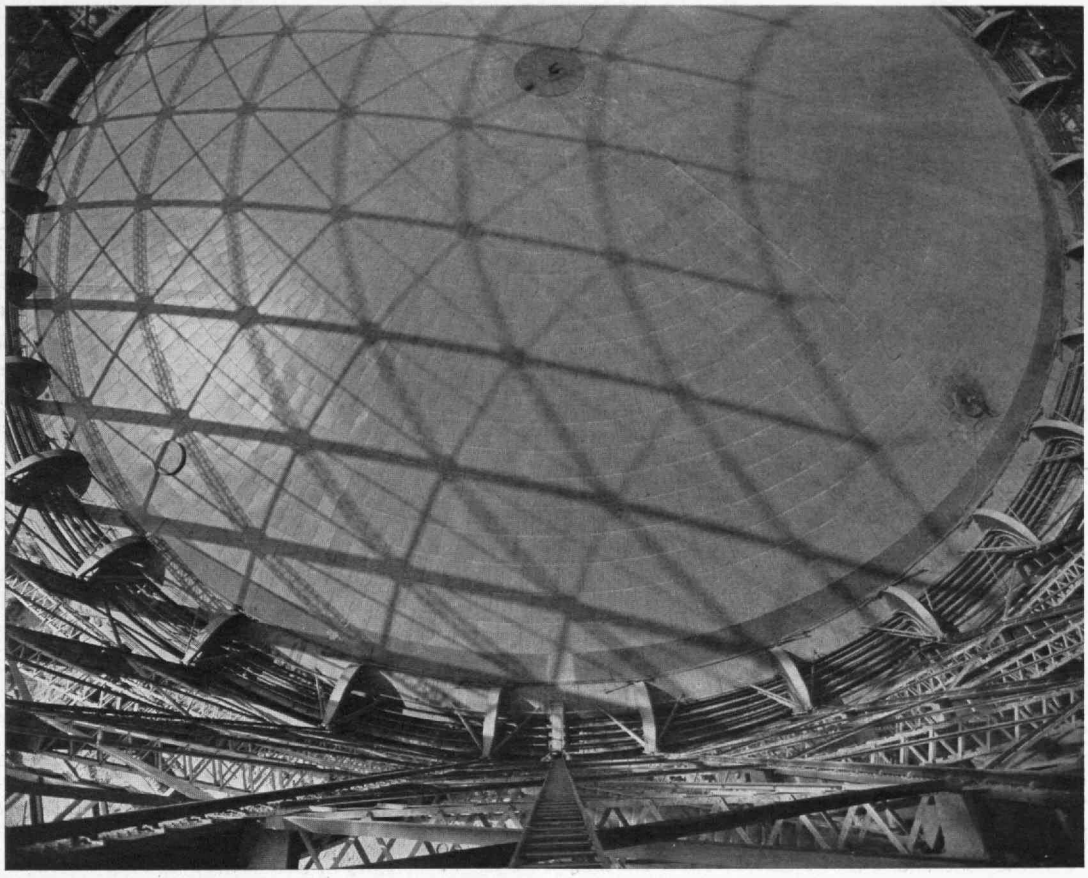
The finished article, due to microscopic voids, has a porosity which makes it a sort of "metallic sponge." This property accounts for the large use of the method in the manufacture of "oil-less" bearings where the pressed and heated bearing is quenched in lubricating oil and left submerged until the capillary pores are completely filled with the oil. "Oil-less" bearings are proving their worth in electric fans, clocks, and refrigerators as well as in the automotive industry for spring shackle bearings, steering gear bushings, clutch pilot bearings, generator and water pump bearings, and so on. Since this porosity can be controlled, stainless alloys have been produced of half the specific gravity of rolled steel.

Other advantages, which Mr. Hardy cites, include the fact that metal of the highest purity is obtainable — iron alloys substantially free from sulphur, phosphorus, carbon, and nitrides — which open new opportunities for the metallurgist. Also alloys and mixtures of metals, immiscible in the liquid state, or having great differences in melting points (such as copper and tungsten) may be produced. Yet further possibilities are to be found in mixtures of metals and non-metals, such as tungsten carbide and cobalt (the carbide cutting tools) and copper and graphite for current collecting brushes on dynamos and motors.

The method has as one of its most interesting features, however, its adaptability to the production of useful bi-metals. "A rectangular mould may be three-quarters filled with powdered iron, the surface leveled, and the remainder filled with nickel. Pressure then converts this to a composite ingot, heating and rolling produces a thin plate or sheet — part iron, part nickel — perfectly welded together. In a similar manner composite tools may be manufactured with a steely strong base and a layer of excessively heavy alloy on top. . . ."



Scale drawing of one of the 30-foot Hoover Dam penstocks as it will be anchored in a curved section of one of the 50-foot diversion tunnels. One of the two main-headers on either side of the dam will be in a tunnel especially driven to pipe size. The other header on either side as shown above will be placed in a plugged diversion tunnel. *See next page*



A new slant on the familiar gas tank. Looking down on the crown of the floating gas holder from the top of the latticed guide frame

Courtesy, McClintic Marshall Corporation of the Bethlehem Steel Company

Pipe of Pipes

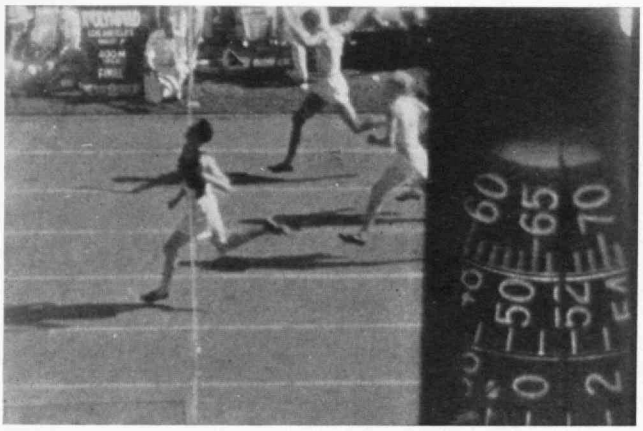
WHAT a venture in superlatives is Hoover Dam! We had duly digested arrays of statistics on heights and horse power, acre-feet and cubic yards of concrete, but not until we had visited Boulder City and descended into Black Canyon under the instructive guidance of a government engineer, did we obtain any adequate conception of the magnitude of this great reclamation project. We were there in July when temperatures were running well above 100°, when all the relentless and oppressive elements of that forbidding region were conspiring to retard construction. But the work was proceeding at full speed, in fact in excess of full speed, for the Six Companies, Inc., is well ahead of schedule regardless of such interruptions as flash floods (which again last month poured into the diversion tunnels).

Despite the weather, we were able to obtain some of the more intimate details of the new penstock design which calls for colossal welded plate-steel pipes, record-breaking in diameter and strength. Original designs for the dam and "appurtenant works" called for concrete-lined penstock tunnels. Subsequent studies induced by experience with other hydroelectric and irrigation structures convinced engineers of the Bureau of Reclamation that steel pipe would be safer and more efficient. With the boldness which has characterized the whole project, they forthwith called for bids on three different schedules or systems of plate-steel penstock piping. Schedule No. 1, which was finally chosen, required 4,700 ft. of pipe, 30 ft. in diameter and nearly 3 inches thick.

Consider for a minute what these dimensions mean. The outside diameter of each of the Holland Tubes is 29 ft.; the steel main-headers of Hoover Dam could easily enwrap one of them. The pipes are larger than the usual double-track railroad tunnels; two trains could be run through them side by side with ample room to spare. One piece of this pipe, 12 ft. long, will be made from three steel plates so heavy that only two of them can be shipped from the steel mill to the fabricating plant on one railroad car. Two such pieces of pipe welded together comprise one erection-section weighing 150 tons — heavier than many types of railroad locomotives.

The Babcock and Wilcox Company, by submitting a bid of $10,908,000 was awarded the contract for the fabrication and installation of the pipe. Because the main-header tubes will be too large and heavy for transportation, B. & W. must build a special fabricating plant near the edge of the canyon. The heaviest plate, weight 23 tons, will be 2⅞ inches thick, nearly 12 ft. wide, and 32 ft. long. The bending rollers for shaping the plates to the circle will be of the vertical type and the largest ever built. The plate will enter the rollers on edge with at least a 44-inch diameter roller on one side and two 32-inch rollers on the other. The pull-down capacity will be 4½ million pounds.

The total linear footage for all welds, including those for stiffening rings and the like, will be about 400 thousand ft. B. & W. must make x-ray examinations of all of the welded seams and the quantity of x-ray film required (about 23 miles) will exceed the total of that produced to date for all industrial purposes. In



The finish of the 400-meter final in the recent Olympic Games as recorded by the Kirby Two-Eyed Camera. See adjacent article

addition to the 30-ft. pipe, the plans call for 1,900 ft. of 25-ft. pipe, 5,600 ft. of 13-ft., and 2,300 ft. of 8½-ft.

Depressions Stimulate Invention

RECORDS of the United States Patent Office indicate that periods of economic distress have a stimulating effect upon inventors, and that many important inventions of the past have transpired during times of great business and industrial uncertainty. Writing recently in the United States *Law Review*, Joseph V. Meigs, '16, recalled that the Bessemer-Kelly process, which revolutionized the production of steel, reached maturity during the depression of 1873. In the 20 years which followed over 100,000 miles of steel railroad were built, mostly of Bessemer steel. The telephone, phonograph, and electric lamp, reinforced concrete, and the air brake all contributed to the period of prosperity following the crash of 1873.

What great inventions of wide commercial application will help pull us out of the present depression remains to be seen. Meantime the American inventor (he may be a whole research laboratory) is breaking records in patent applications. During the year ending June 30, he was granted a total of 52,572 patents, or more than 1,000 a week, an increase of 8,255 over the previous year. And in world totals the American inventor also leads, for from the beginning of patent records up to the close of 1930, he had been granted 1,797,380 of the total of 6,192,873 patents granted in all countries. Germany, popularly supposed to be the mother of innumerable inventors, ranked fourth, with France second, and England third.

It was during the industrial doldrums of 1921, Mr. Meigs showed, that industry began the commercial application of the inventions of Marconi, De Forest, Alexanderson, Fessenden, and others. The rapid development of broadcasting followed and with it the wheels of industry began to turn in the manufacture of all the apparatus demanded by the various ramifications of that industry now described as radio. And in this present depression, Mr. Meigs believes, as does Mr. Cameron (Page 12) that "new ideas, new products, new processes, new industries, in a word, inventions — these things have played a vital part in previous periods similar to the present one — have been one of the forces in boosting us out of previous sloughs of despond — and will do the same now."

Two-Eyed Camera vs. Stop Watches

AT THE National Air Races in Cleveland, at the Olympic Games in Los Angeles, and at various track meets this past spring and summer, spectators witnessed the first trials of a new electro-optical timing system, designed to obviate human fallibility in the clocking and judging of racing events.

The neat tripod-mounted machine which squinted an inquiring eye at each finish line was a combination motion picture camera and timing device (both devices have been separately used in recent years) that photographed, to the accompaniment of a buzzing obbligato, the finish of a race and the time of that race as recorded to 1/100ths of a second on the dials of a built-in precision clock. Designed by the Bell Telephone Laboratories for Electrical Research Products, Inc. ("Erpi"), the mechanism is called the Kirby Two-Eyed Camera because it was suggested by Gustavus T. Kirby, Chairman of the Olympic Games Committee and of the Advisory Committee of the I. C. A. A. A. A.

The Two-Eyed Camera embodies three specific improvements over previous methods of judging and timing:

(1) *A photographic record of the order of finishing and time of the event;*

(2) *Mathematical accuracy that eliminates the average human fallibility in judging and a normal time error in the pressing of a finger on a stop watch;*

(3) *The ability to time to 1/100ths of a second instead of 1/10th of a second as existing stop watches do with difficulty. At the National Air Races the difference of 1/10th of a second is far too great for accurate timing.*

The heart of the camera is a tuning-fork so precisely built as to register time accurately to 1/100ths of a second. Three concentric dials keep time, one registering minutes, another seconds, and a third, one-hundredth seconds. These dials are connected by wires to the starter's gun so that they begin to revolve the moment the hammer of the starter's gun clicks. When the race is started by a flag, the camera photographs the starter's flag as it is waved and the electric clock registers the time photographically on the same film. In the events, such as the three-kilometer speed trials, where the start and finish lines are not at the same point, two cameras are operated synchronously by electrical interlocking, one at the starting point, the other at the finish line.

The camera is a 16 mm. motion picture camera capable of shooting 128 frames a second. The dials revolve from the moment the race starts and the camera is operated as the participants approach the finish line. Through a double lens it photographs both the participants finishing and the time of each picture as shown by the constantly revolving dials. (See picture above.) The finished film shows indisputably the order of finishing, and to gauge the time it is only necessary to pick out the frame showing the racer crossing the finish line. In the same picture is his time, forming a permanent record of the race.

Stop-watch times at the Olympic Games when compared with times recorded by the Two-Eyed Camera show expected variations. Of the 82 races (including trials) which were timed by both methods, 58, or 71%, were shown to have been slower than the stop watches indicated. Of the 24 races for which the stop-watch times were greater than the camera times, practically all were in the middle or long distance class (400, 800, 1,500, 5,000 meters). Obviously, stop watches show sprints to be faster than they actually are.

The advantages of the Two-Eyed Camera are not to be gainsaid, but can it be made available for all track meets, requiring as it does trained operators? Unless it can be applied universally, there will be no comparable records. Its general adoption would practically invalidate all past records based on stop watches.

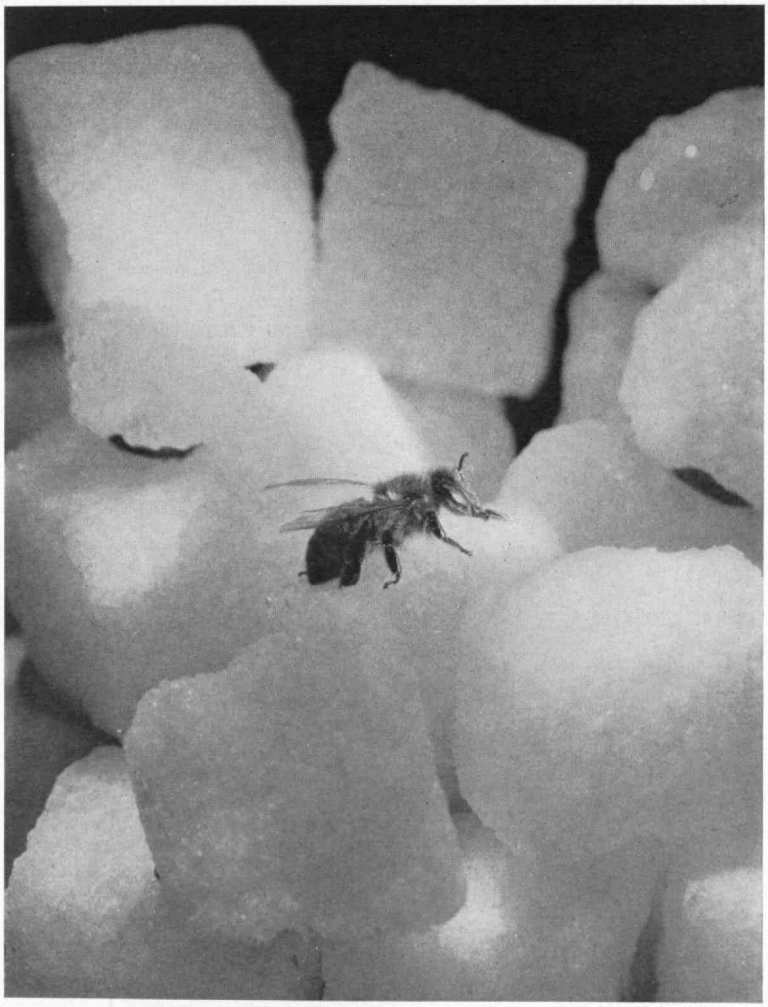
For Readers of the Times

THERE is a story of a college student, presumably a freshman, who fulfilled part of his duties toward a course in composition and rhetoric by reading Stevenson's "Virginibus Puerisque and Other Essays". He found in the book sentiments with which he agreed and observations which he judged to be profound. He wrote "very true" at many places in the margin opposite passages to which he might wish to refer later, and again "very true," "very true" until the book was fully annotated. Some years later on opening the book and finding his marginalia, he experienced a feeling of deep humiliation.

That's the story. Had the man been asked to analyze his feelings, he would perhaps have found himself troubled to do so successfully. The passages which he had noted had contained truths that he already knew — else he wouldn't have noted them. Yet he hadn't previously thought of them for himself. Stevenson had brought them to his attention. And now, when he settled down to an evening of enjoyment with the book, how many of the truths again struck him with the shock of novelty, how many there were, known and forgotten, which ought to have been useful to him during the time which had elapsed since his college days.

We tell the story because we've been reading Pliny again, and, if it isn't humiliation that we feel, it is certainly deep humility. We imagine that many an engineer, or chemist, or physicist, or architect, or artist — or politician who would like to find the cure of all evil — would feel the same way about it. The old fellow knew so much, and in many cases philosophized so well about the things that he knew.

Pliny was born in Como in the year 23 A.D., and died in the year 79 while observing an eruption of Vesuvius. His *Natural History*, which is an encyclopædia of the scientific knowledge of his time, contains some misinformation and an amazing amount of information which is good. It cites 146 Roman and 327 Greek authorities. In it are to be found directions for the preparation and use of pigments, of cures for boils, leprosy, and watery eyes, a treatise on glass and glass-making, directions for building a wall, setting a foundation, and laying a pavement, an account of the principles of classic architecture — things that are quaint, curious, important, practical, trivial — things that we've wondered about or remember dimly that we've met. We cannot here print an essay on Pliny, but must content ourselves with the quotation of three passages which appear to be not without interest at the present time.

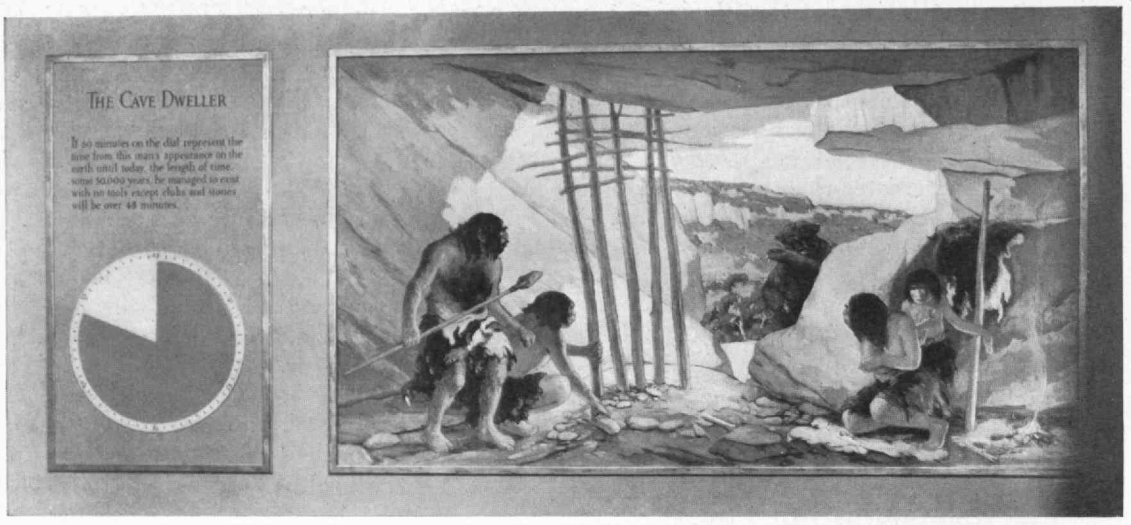


Arthur E. Smith (London)

A bee amid boulders of sugar — a photomicrograph

After discussing the different sorts of bronze which are produced by alloying copper in various ways, Pliny says:

"In days of old, the skill of the artist was valued more highly than his material, even when the copper had been alloyed with gold and silver: today it is a question whether the art or the material is the more worthless, and we are amazed to find that, in an age when the prices of ancient masterpieces have passed all bounds, art is completely discredited. For artists, like the rest, have begun to ply their trade for gain, and not for glory as of old (for then works of art were ascribed to the gods, and for the noblest in all lands the path of art was the road to fame), and the process of casting valuable bronzes has been so



On this and next page: The drama of man's advancement from primitive beginnings as recorded in four murals on the walls of New York's Museum of Science and Industry

Murals by Howard McCormick. Photographed by Peter A. Juley and Son

completely lost that results once achieved with certainty by skill have long been denied even to happy chance.

"Corinthian bronze held highest place among these glorious metals of antiquity. Fortune made the mixture when captured Corinth blazed, and it is sought by many with an extraordinary zeal. This is illustrated by the story that Verres, whose condemnation had been secured by Cicero, was proscribed with that same Cicero by Antony, simply because he had refused to hand over to him his Corinthian bronzes. My own belief, however, is that in this matter most of the connoisseurs pretend to a very special knowledge which they do not possess, to distinguish themselves from the rest."

That is something for the economists, for fanciers of the antique, for connoisseurs — and it contains a thought for the owners of secret processes.

After describing the various ways in which *cadmia* (zinc oxide) and flowers and scales of copper are prepared for use in medicine, Pliny adds:

"All this is unknown to the physicians — by their leave be it spoken. Most of them pay allegiance to the names of the remedies and are far from being able to prepare them, although this used to be the essence of medical practice. Now, as often as they turn to their books, wishing to compound something from them, in other words to test their prescriptions at their patients' expense, they put their trust in the shops of the Seplasia which sophisticate and spoil all their wares. Ready-made plasters and salves are now on the market, and deteriorated goods and the deliberate falsifications of the Seplasia find their way into the mortar."

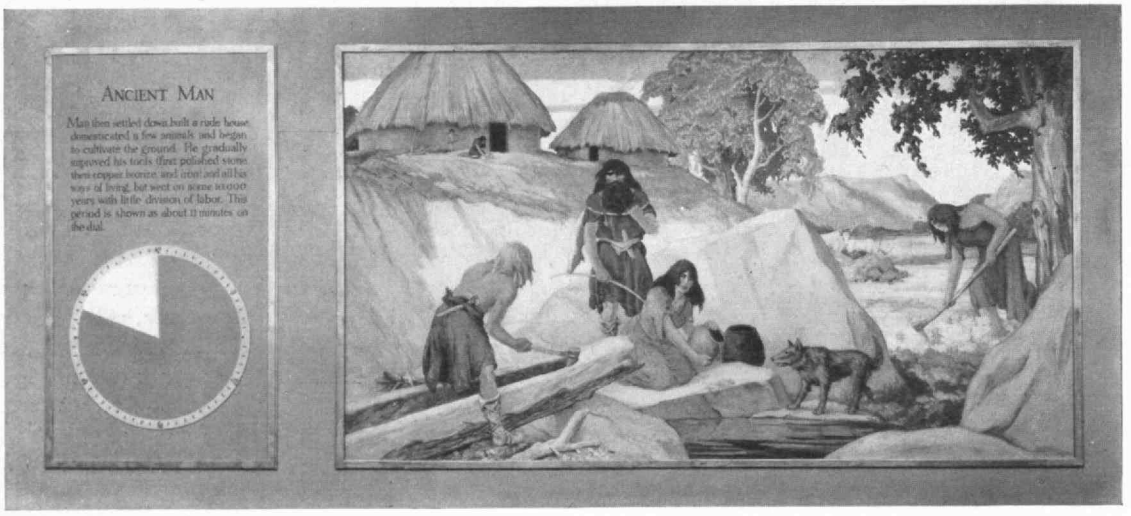
We wonder what high-pressure advertising was used in the first century of the Christian Era. At any rate, it was before the Pure Food and Drug act went into effect.

Pliny commences his account of the ores of iron by remarks which remind us strongly of the things which were said about gunpowder and chemical warfare 16 or 17 centuries after his time.

"Our next subject must be the ores of iron, a metal which is at once the best and the worst servant of humanity. With iron we plough the earth, plant trees, prune orchards, compel the vines to put forth young shoots by pruning away each year the withered growth, build houses, quarry rocks, and accomplish every other useful purpose. But iron is also the minister of war, murder, and robbery, not merely as a weapon at close quarters, but forged for swift flight, now hurled by an engine, now winged, by the most infamous cunning devised by the human mind, for, to bring death more speedily to our fellow-man, we have given wings to iron and taught it to fly. Let the blame for such a death be brought home to man, and not to Nature."

New Concrete Pipe

FROM Czechoslovakia, that energetic little country whose products, from pins and pewter and pottery to perforated shoes, have found their way to the far





The ages of mankind as illustrated by the murals cover periods of 50,000 years (the Cave Dweller), 10,000 years (Ancient Man), 600 years (the Craft Age), the 18th Century onward (the Modern Age)

corners of the world, comes news of the development of a new type of semi-flexible concrete pipe. Manufactured by the centrifugal method, this new pipe which is soon to appear in America is said to be capable of withstanding pressures of 300 pounds to the square inch.

One of the remarkable features of this pipe is its peculiar flexibility. In its construction longitudinal reinforcing is arranged around a metal core. A steel-lined wooden mould is employed in shaping the pipe sections, and a grout of Portland cement and sand is forced in under pressure. After the original tube is poured and has aged a day, it is wound with hot spiral reinforcing steel and then placed in a second mould for a final layer of concrete. The finished product is ready for construction purposes four days after moulding.

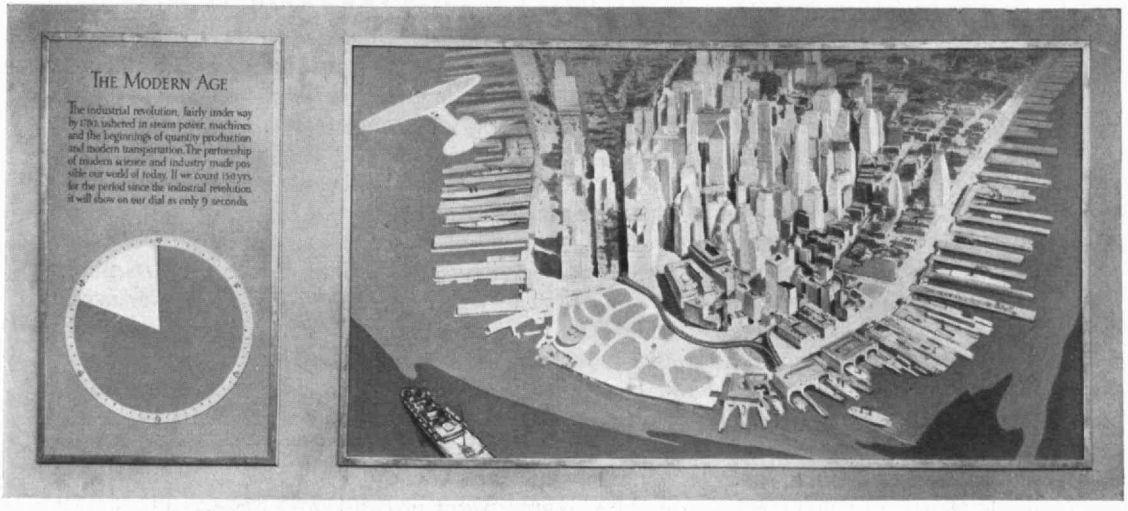
The new pipe is designed to permit unusually rapid joining, a period of only five minutes being required to couple sections. The cost of manufacture is said to be below that of metal pipe, and the concrete is resistant to acids and alkaline solutions.

Saving Surfaces with Rubber

RUBBER'S versatility has been extended to include the prevention of corrosion. Two of the latest offerings are (1) new rubber paints, and (2) corrosion-resistant linings for engineering apparatus. The new rubber paint ("acidseal") available in this country has as a base a commercial form of isomer. It has exceptional properties of adhesion, will dry in one hour to a hard film, and possesses rubber's chemically resistant properties. Because of its elasticity it will conform to the expansion and contraction of its support.

In Germany chlorinated rubber is being used extensively for painting iron, concrete, and wood. One company markets such a coating under the name of "Tornesit," a product much used for painting gas and water piping.

The use of rubber linings to prevent corrosion or to avoid contamination in industrial process equipment has been extensively studied by the B. F. Goodrich Company. A paper on that subject by H. E. Fritz and J. R. Hoover was presented at a recent symposium on rubber held by the A.S.T.M. Vulcanized rubber, they noted, can be made to resist actual immersion for long periods in any of the inorganic acids, except those of strong oxidizing character, and can likewise be made inert to most inorganic salts and alkalies and to many commercial organic materials. Factors limiting the use of rubber as a chemical resistant are temperature, vigorous oxidizing agents, and certain classes of organic materials. Above 150° F., the effects of oxidation, diffusion, and absorption become aggravated. It is interesting to note that pure water affects rubber more seriously, particularly at elevated temperatures, than many chemical solutions. This is believed to be due to molecular diffusion.



Hard rubber, in general, resists destruction much better than soft rubber but its

brittleness when cold, its lack of resistance to abrasive impact, and its low coefficient of linear expansion limit its use in chemical-process work. It is possible, however, to combine it in such a way with soft rubber ("triflex" lining) that its desirable properties can be retained and its undesirable ones mitigated.

Rubber lining is already being applied to tanks, tank cars, pipe valves and fittings, drums and barrels, pumps, fans and blowers, rotary grinding mills, bearings, and centrifugal gaskets. Special rubber compounds to resist corrosion have been developed for belting, gaskets, hose and tubing, moulded products, rollers, clothing, and sheet rubber.

The importance of these recent developments in the application of rubber to industry is well indicated in the estimate of Messrs. Fritz and Hoover that approximately $200,000,000 is lost annually in the United States by corrosion and erosion.

Engineering Chronicle, Cont.

TO complete this month's stocktaking of engineering achievements, now current or impending, would require a list forbiddingly long (despite economic conditions there must be at least a hundred additional items worthy of mention). Tempering the list to shorn space still leaves an array sufficiently imposing to substantiate Mr. Cameron's contention (Page 12) that there is still an engineering frontier.

The field of transportation alone furnishes many items: the Pennsylvania's electrification, speeded by a loan from the R. F. C.; the new two-motored Boeing transport planes which may presage feats such as 24-hour coast-to-coast passenger service; the S. S. *Manhattan* and her recently launched sister, the *Washington* (the first U. S. built merchant ships for the transatlantic passenger trade since the *St. Louis* and *St. Paul* of 1897); the Italian liners, *Rex* and *Conte di Savoia*, the maiden voyages of which are to take place as these lines are current. Each of these latter ships is comparable in size, speed, and luxury of appointments with the *Bremen* and *Europa*, and the *Conte di Savoia* is the first large liner to be equipped with a gyroscope stabilizing plant. Of a different category but equally notable is New York's Inland Freight Terminal No. 1, designed, built, and financed by the Port of New York Authority. In terms of cubic content it is New York's largest building, and it will effect great economies in the distribution of less-than-carload-lot freight.

The much publicized Dnieprostroy hydroelectric plant has stolen attention from two other Russian achievements: a huge canal, 225 kilometers long with 19 locks, from the White Sea to the Gulf of Finland, which is reported to have been building for three years; and the enormous mining and metallurgical development being carried out under the supervision of an American company at Magnitogorsk in a corner of Siberia about 1,200 miles east of Moscow. There two blast furnaces, the largest in Europe, are now operating and eventually there are to be eight in all, producing annually 2,500,000 tons of iron.

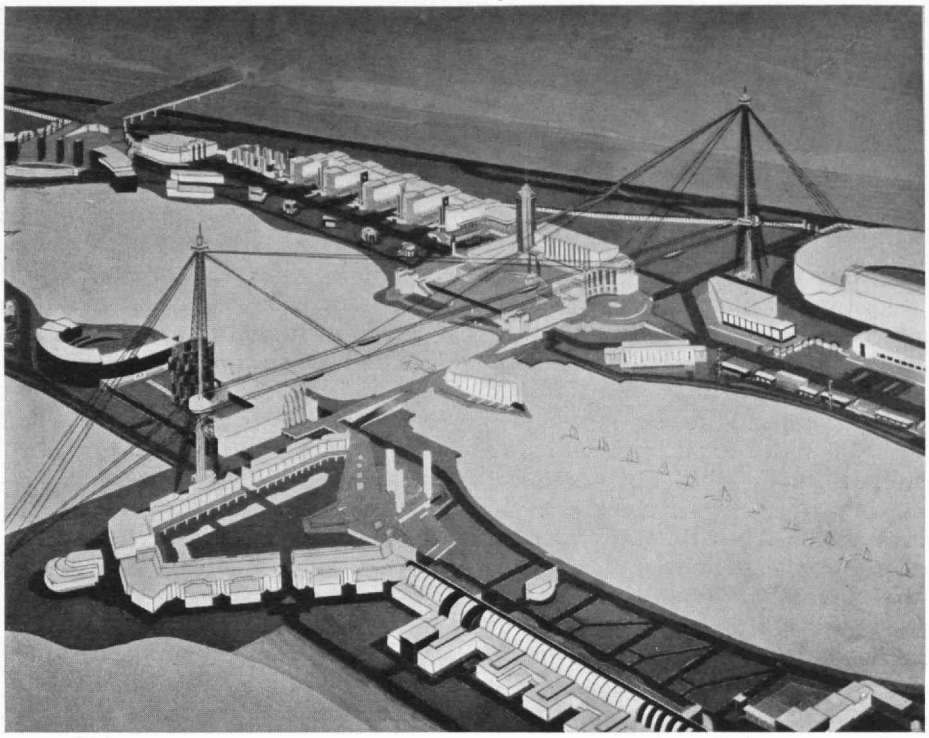
Another new European record, that for bridge lengths, is to be established by a two-mile structure to connect the islands of Zealand and Falster, on which a start is planned for next month. It will be built by an English firm under a contract awarded by the Danish government and three and a half years will be needed for completion. Some 29,000 tons of steel are involved and the name — Strostroemsbroen Bridge — would seem to be commensurate with such a quantity.

British bridge builders are also busy at present putting up a noteworthy structure between Middlesborough and Durham, England, known as the Tees (Newport) Bridge. It is the first vertical-lift bridge in Great Britain and its 270-ft. lift span, suspended from towers 170 ft. high will provide for a vertical clearance of 120 ft. In the Durham approach the tracks of the London and Northeastern Railway are crossed by a five-span welded bridge 218 ft. long.

In the Rhine River valley the first section of the international *Canal d'Alsace* is nearing completion under French auspices. This project forms the upper portion of a power and navigation development from Basle down to Strassbourg, where the Rhine-Marne canal comes in — a distance of 136 miles.

Last month also saw a beginning on the task of laying down a total of nearly 1,200 miles of pipelines across deserts and practically trackless wastes in order to make 'Iraq's oil available on the eastern shore of the Mediterranean, where it will be adjacent to a great trade route of world commerce and not far from important markets. The 'Iraq Petroleum Company, which has a 75-year concession for the development of 'Iraq's oil resources, will have one line of 531 miles length run from Kirkuk, on the eastern bank of the Tigris about 150 miles north of Bagdad, to the Syrian port of Tripoli; the other of 618 miles length from Kirkuk to tidewater at Haifa in Palestine. The pipeline system, under the terms of the Convention between the 'Iraq Government and the Company is to be capable of handling a minimum of 3,000,000 tons yearly and must be completed by December, 1935.

If it were not for Hoover Dam, the Owhyee in eastern Oregon, dedicated last summer by the U. S. Bureau of Reclamation, would transcend all others. For the time being it is the world's highest since it rises 417 ft. above the bed of the river whose name it bears; it cost $6,000,000; and the 540,000 cu. yds. of concrete in its massive barrier impound water to form a lake nearly 50 miles long and provide for the irrigation of 125,000 acres. On the Columbia River, not far from the site of the Owhyee, the Bureau of Reclamation expects to locate another dam — straight gravity type, 420 ft. high and 4,000 ft. in length, or nearly four times that of Owhyee. It will be the central feature of what is now known as the Columbia Basin project and part of the 1,000,000 horse power of primary and 1,000,000 horse power of secondary power developed by the dam would be used to pump 16,000 sec.-ft. of water against a 365-ft. head for use in irrigation. The 1,200,000 acres which it is planned to irrigate occupy the southerly half of the area enclosed by the curve which the Columbia makes between its junctions with the Spokane and the Snake Rivers in the State of Washington. It is the Bureau of Reclamation, incidentally, that has designed Madden Dam to be built on the Chagres River in the Canal Zone.



Architect's drawing of the "Sky Ride" which will be one of the spectacular features of Chicago's 1933 World's Fair — A Century of Progress Exposition. Two steel towers 600 feet high and 2,000 feet apart will be connected by cables at the 200-foot level, carrying rocket cars which will shoot through the air at high speed. At the tops of the towers will be observation platforms from which visitors will be able to see Chicago and its surrounding area for miles in all directions.

Also, if it were not for the tunneling operations on Hoover Dam, popular interest in the subaqueous tunnel, being driven between Boston and East Boston, would be such as to make it one of the first projects on the list. It is featured from a design standpoint by the most extensive use to date of pressed-steel liner plates instead of the customary cast-iron segments; and from a construction point by a revolutionary change in muck-handling methods, for a continuous-belt conveying system takes the excavated material from the face of the shield, in compressed air under the harbor, passes it automatically through twin air locks, and on upward to street levels. New York's new Eighth Avenue Subway (price: $191,200,000) is likewise worthy of attention. Seven years were required for its building and it is significant that this, a municipal venture, was carried through with great engineering competence.

American waterway projects loom large in any survey of what impends. Although some of these proposals are apparently destined to remain in the "paper stage" at least two of importance are nearing completion — the improvement of the lower 44 miles of the San Joaquin River to make available a 26-ft. depth of water from the Pacific Ocean to Stockton; and the Illinois waterway (price, $107,500,000) from the Great Lakes to the Gulf of Mexico — down which will float a half million tons of freight a month. Water to operate the first section of the waterways is taken from Lake Michigan at Chicago into the sanitary canal down which barges will travel to Lockport, Ill. From Lockport to Utica, Ill., the route is over the old Illinois waterway, and from Utica down the Illinois River to the Mississippi at Grafton.

The Port of New York Authority, in a statement filed with the War Department, has recommended the deepening of the New York State Barge Canal to 14 ft. between locks and of providing 20 ft. vertical clearances under bridges. Because of the difficulty of making immediate transfer of title to the Federal Government, the Port Authority has suggested some plan of financing similar to that by which Federal highway funds are made available to the states.

The dedication of the Welland Canal (a complete account of this ambitious undertaking appeared in The Review for April, 1930, at which time its first section was opened) and the signing of a treaty by negotiators for Canada and the United States last summer refocused interest on the dream of bringing ocean commerce to the Great Lakes. To build the St. Lawrence seaway would indeed be a stupendous feat — the estimated net cost to the United States alone (making allowances for work already done) is five-sixths that of building the Panama Canal, and Canada's net cost (making similar allowances) is about seven-eighths that which the United States expects to spend on the Hoover Dam. By no means, however, is it yet settled that there will be an immediate commencement of the St. Lawrence venture for, despite the matter of funds, the treaty is yet to be ratified, certain domestic differences must be composed, state and provincial governments appeased, and a market found for the prospective power development. Yet the St. Lawrence seaway seems manifestly less visionary now than in 1931 and the fact that it is thought of at all in the face of the manifold tribulations besetting both governments is assuredly no omen of evil.

THE INSTITUTE GAZETTE

Report of the Visiting Committee of the Division of Industrial Coöperation

IT IS highly desirable that the policy of the Institute with regard to industrial research be more clearly defined than at present. The two meetings of the Visiting Committee of the Division of Industrial Coöperation were accordingly devoted entirely to a discussion of this general subject in the attempt to prepare a statement of policy which could be submitted to the Corporation, and, with its approval, serve as a basis for more effective coördination of Institute research in the service of industry. In addition to meetings of the committee, a number of conferences have been held in order to obtain the views of staff members, and in particular those who have had long experience with the affairs of the Research Laboratory of Applied Chemistry.

Two basic ideas are thoroughly agreed upon. First, the Institute should make an organized effort to extend the service which it now provides for industry, as far as this can be done without detriment to its teaching and other research activities. Second, for more effective effort, all work of industrial coöperation and industrial research in the Institute should be unified.

It is recognized that there are several general forms of industrial research:

1. Closed research, conducted confidentially for an individual or corporation, with no initial provision for publication of results, which are to be known at M.I.T. only to those working directly on the research.
2. Semi-closed research, which is similar, except that provision is made for publication upon release by the client.
3. Open research, involving no secrecy, and contemplating immediate publication of all important results.
4. Minor research, not ordinarily of sufficient importance to warrant publication, and involving short tests, library searches, or the like.

These forms may all involve definite relations between the Institute and an outside party. In addition there is the matter of personal consultation by individual staff members, ordinarily involving little or no use of Institute facilities, and with which this report is not primarily concerned.

It is agreed that at the Institute semi-closed research is much preferable to closed research, and that the latter should be in general avoided, except where it is shown that the nature of the problem warrants and that the service rendered to industry may be large. These forms of activity should be undertaken under contract providing for full reimbursement to the Institute and not less than would be charged for similar service by a commercial consulting laboratory of high standing. Particularly for closed research, the financial return to the Institute should be very adequate as a prerequisite to undertaking the work. It is not desirable to compete for such work against subsidized State or industrial research agencies, but rather to stand on the superior quality of service which can be rendered by the Institute.

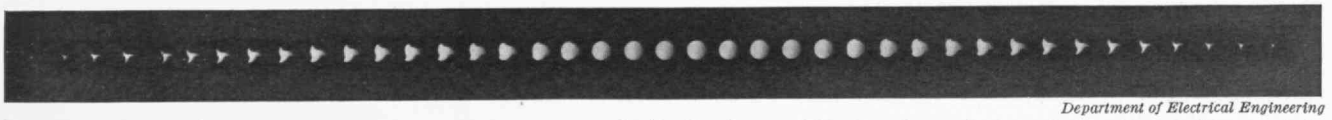
It is felt that open research, however, may well be undertaken at bare cost, or even, where the value of the presence of the research at the Institute is of definite value as an adjunct to teaching, and where the results promise to be of great general utility, on a basis whereby the Institute actually contributes to the total cost. It appears also that the Institute is warranted in providing for minor research as a matter of good will and courtesy to the public without attempting completely to balance the fees received against the cost of such service.

It is believed that the advantages of industrial coöperation and research lie in, first, the training afforded to those assisting in the research, and the natural introduction into industrial work of recent graduates; second, the stimulation and opportunity for advancement in the profession afforded to members of the staff; third, the service rendered to industry and the good will resulting thereby; and fourth, financial return to aid other research of a less immediate practical nature.

In order best to attain these objects it is felt that, should industrial research grow so as to overcrowd the present plant, it is desirable to expand the general educational buildings rather than to provide a building especially assigned to industrial research work. Those members of the staff who are primarily engaged in teaching and those who are primarily engaged in research would both thereby be substantially benefited in their work. Also, while all fees received from industrial research activities should be paid into the general funds of the Institute, it should be the general policy to support departments which successfully carry on such work by appropriating to their use, for allied research of general utility, funds which become available by reason of the excess of fees over actual costs.

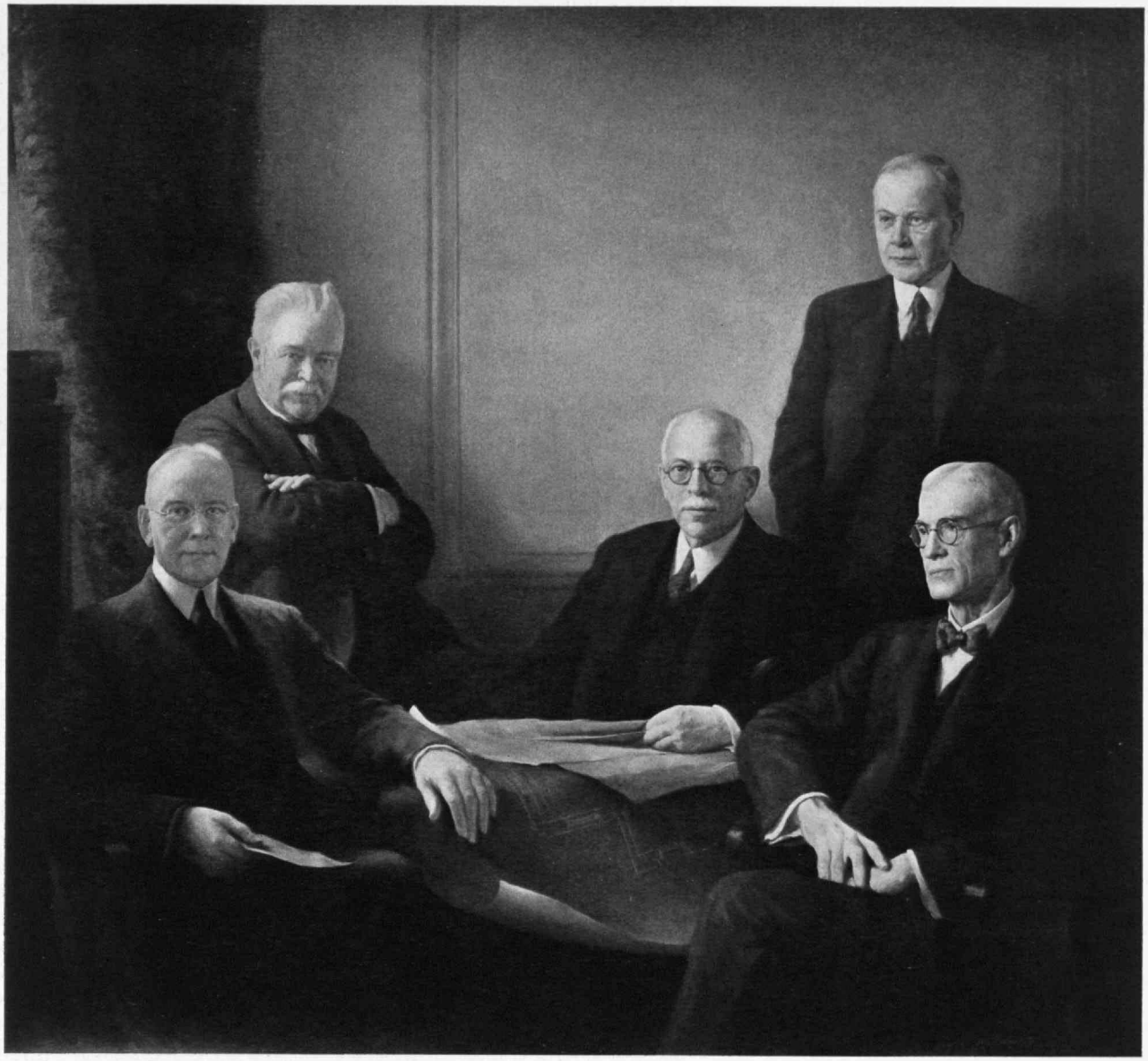
The centralization of control of research activities of this sort is desirable. In order to effect sufficient unification the following features of procedure are suggested:

The use of Institute facilities for industrial research of any sort should always be subject to the approval of the Department Head concerned, and all important arrangements involving such use should be reported to the Director of the Division of Industrial Coöperation for his information.



Department of Electrical Engineering

Opening and shutting of a camera shutter set for an exposure of 1/200th of a sec. This record was photographed at the amazing speed of 4,200 pictures a sec.



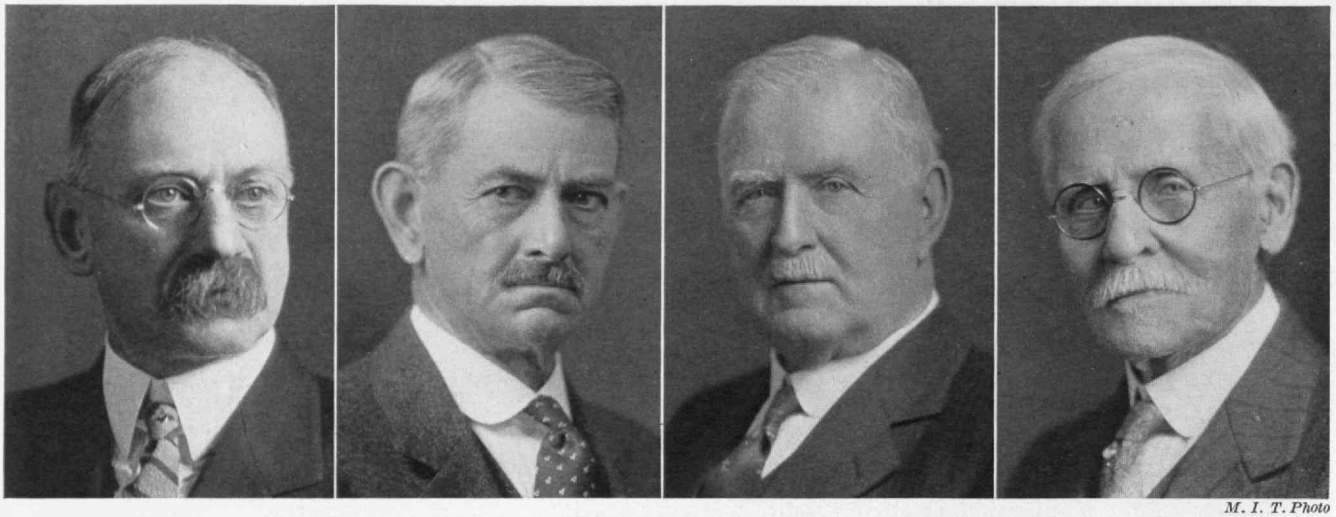
Five professors who have been associated with the Institute's Department of Architecture for more than 40 years. From left to right they are: William H. Lawrence,'91, Architectural Engineering (in charge of Course IV-A); C. Howard Walker, Philosophy of Architecture; John O. Sumner, History; Harry W. Gardner,'94 (standing), Architectural Design; and William F. Brown, Freehand Drawing. Under the sponsorship of Dean Wm. Emerson, of the School of Architecture, the portrait was painted by E. Pollak-Ottendorf, the cost being met by contributions from graduates and friends of the Department

All industrial research, except minor work, the limitation of which should be specified, should be the subject of contract or agreement between the Institute and the outside agency. Such contract, which may be initiated by the department concerned, should however be approved by the Director of the Division, acting under the direction of the President, before being entered into. The Director should, in coöperation with the Bursar and the Department Head, ensure that the reimbursement to the Institute is adequate, and determine that the agreement is in full accord with Institute policy. Each department should be requested to designate an individual or committee through whom the Director may make contacts with the work in the department.

The individual, laboratory, or department involved should make technical reports to the client directly and should assume responsibility for the accuracy of the results reported. It is expected that a given laboratory will undertake work along a certain line only for a single client, unless with the full approval of all parties concerned. On the other hand, it is highly desirable that industrial research throughout the Institute should be undertaken for a large number of clients, and that the contacts of the Institute as a whole with a particular large industry should not be limited to a single firm or organization of that industry.

In its supervision of contracts the Division should ensure that the name of the Institute is guarded against any improper use, and that research along a given line is undertaken by those departments particularly fitted to carry it on to best advantage.

Your committee feels that, under proper organization and with intense and sustained effort, the activity of the Institute in connection with industrial research can



M. I. T. Photo

Four greatly beloved professors, known to thousands of Technology men, who have retired, all with the title of Professor Emeritus. From left to right they are: F. A. Laws,'89, Professor of Electrical Measurements; A. G. Robbins,'86, Professor of Topographical Engineering; R. H. Smith, Professor of Machine Construction; J. R. Lambirth, Assistant Professor of Mechanical Engineering

be considerably extended to the mutual benefit of the Institute and of industry generally. It is considered that this can be furthered by giving dignified publicity to the attainments and capabilities of the staff and the unique facilities which it has for this purpose.

Signed

A. FARWELL BEMIS, '93
H. E. WORCESTER, '97
REDFIELD PROCTOR, '02
W. D. COOLIDGE, '96, *Chairman*

Registration Forecast

WE again present an advance estimate of the Institute's registration for the academic year just opening as this issue goes in the mails. Registrar J. C. MacKinnon, '13, has prepared it, and last year when he made a similar forecast, it turned out that he was strikingly near the final figures.

After long, arduous meditation over the statistics he has in his possession, he makes the following report:

	Sept. 30 1931	*Sept. 28, 1932 Estimate*
First Year	630	575
Second Year	709	600
Third Year	618	600
Fourth Year	623	625
Graduate Year (including Fifth Year, Course IV)	582	550
Total	3,162	2,950

Sir Arthur Eddington's Address

NO public event at the Institute in recent years has created greater interest than Sir Arthur Eddington's lecture on "The Expanding Universe," delivered in Walker Memorial on the evening of September 7. The distinguished British astronomer, who is Plumian Professor of Astronomy at Cambridge University, was here to attend the first American meeting of the International Astronomical Union, held at Harvard University from September 2 to 9. His lecture at Technology was the only public address of the meeting, which brought to Cambridge the leading astronomers of the world.

The entire floor of Main Hall, Walker Memorial, was crowded, and so great was the demand for admittance that seats for 500 were placed in the gymnasium on the third floor of the building, where Sir Arthur's lecture was piped by a public address system. Transposing to an astronomical key Tweedledee's charming poem in "Through the Looking Glass," President Compton very gracefully introduced Sir Arthur.

The audience, intelligent and discriminating, was said to be the largest ever gathered in Boston for a lay scientific lecture. It was convincing proof of the constantly growing public interest in science and engineering, and of a desire to listen to those whose achievements give full authority to their utterances. To men of science and engineering who attended the lecture, the event must have revealed the rich possibilities that lie in well-considered interpretations of their work to those who appreciate the cultural value of science.

Among the astronomers who came here for the meeting was the Abbé Georges H. Lemaitre, the distinguished Belgian astronomer, who was awarded his doctorate in philosophy at Technology in 1927. He was one of the first of a small group of astronomers to put forth the theory of an expanding universe.

Following Sir Arthur's lecture, members of the International Astronomical Union inspected the new Eastman Laboratories of Physics and Chemistry.

Professor Keyes Awarded Purple Heart

THE high military award of the Purple Heart was presented on September 9 to Lieutenant Colonel Frederick G. Keyes, reserve officer in the Chemical Warfare Service and Head of Technology's Department of Chemistry. Professor Keyes received the medal at a dinner at the Harvard Faculty Club, attended by 20 reserve officers of the Chemical Warfare Service who had recently completed a short period of active duty at the Institute.

Out of Bell telephone making



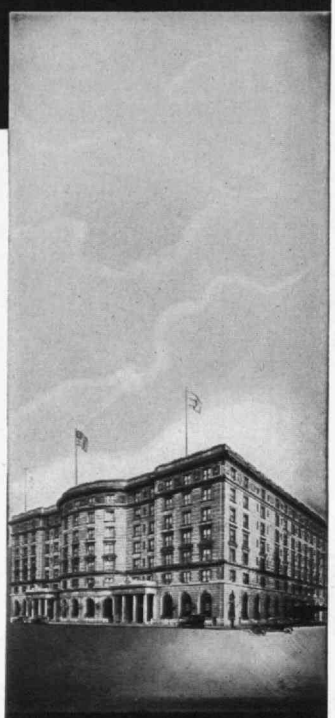
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LOOKING 'ROUND THE CORNER

(*Continued from page 8*)

transmitted and the electrical characteristics of the transmission channel. We have, therefore, the desired means for estimating the relative magnitudes of the various forms of information.

Long experience with telegraph systems has shown that, if the circuit discriminates appreciably against harmonic components having frequencies greater than about three times the rate at which individual letters are being transmitted, there is a serious injury to the signal quality. Inasmuch as there are on the average five letters per word of normal telegraph text, we obtain, using the formula of our second theorem, the number 15 as a measure of the information value of a single word in telegraph code.

In telephony it has been found necessary to preserve harmonic components having frequencies as high as 3,000 cycles per second if speech is to be adequately reproduced. In the case of high-quality transmission for broadcasting, a band 10,000 cycles wide is desirable. Assuming 100 words per minute as a normal speech rate, we find, again applying the formula, that the information index for a single spoken word is somewhere between 1,500 and 2,000.

As a reference point in the transmission of visual information, we may use data pertaining to the commercial picture-transmission system now giving a coast-to-coast service over the nation's telephone network. The equipment used for these transmissions is designed to send a picture, the dimensions of which are 5″ by 7″. This is scanned by a series of lines one one-hundredth of an inch wide which, in effect, resolves it into 350,000 elementary areas. The highest frequency component which would be encountered during the transmission of a picture would occur when adjacent elements are alternately dark and light. In this case there would be one complete cycle of tone value variation for every two elements or 175,000 cycles per picture. This number, without further multiplication or division, is the significant index referred to in our theorem. It must be remembered that we have been somewhat arbitrary in our selection of the amount of visual information, both as to total area and as to fineness of resolution, although it is true that the selection of the size of the elementary area has been made after careful comparisons of pictures built up of areas of different sizes. For a representative photograph of these dimensions the injury to detail becomes objectionable with larger areas; with smaller areas the improvement is so slight that the increased expense is hardly justified.

On the basis of the above index, it would appear that a typical 5″ by 7″ picture is equivalent in information content to 100 spoken words. Apparently the ancient Chinese philosopher was guilty of the unpardonable sin of misplacing a decimal point. He may, on the other hand, have set up a higher standard for his pictured information.

Passing on from the transmission of a single still picture to television, the question of rate reappears as we are confronted with the necessity of completing the transmission of a single image (*Continued on page 30*)

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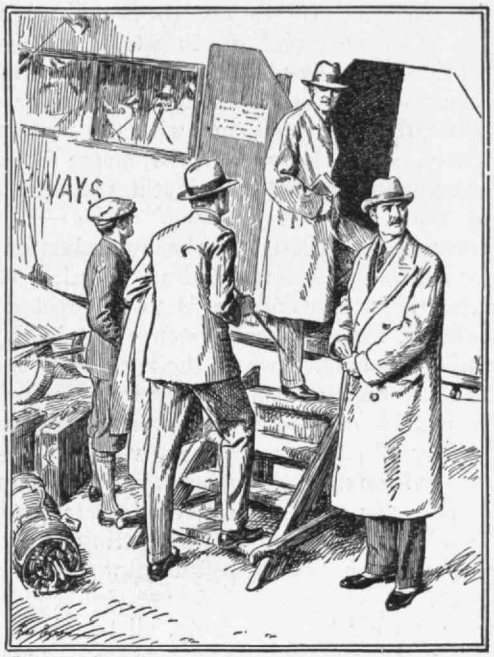
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LOOKING 'ROUND THE CORNER

(*Continued from page 28*)

in about 1/20 of a second. This minimum time must not be exceeded if we are to provide a sufficient number of discreet pictures to satisfy our eyes as to the continuity of any motion which may take place. The above figure has been agreed upon as satisfactory through long experience with the motion-picture art where, also, the reproduced image is composed of a succession of individual still pictures. Remembering that there are 175,000 cycles — not cycles per second — required for the reproduction of the picture which we have selected as typical, it follows at once that if its transmission is to be effected in 1/20 of a second, the electrical system must be capable of responding to a signal wave, the harmonic components of which cover a band 3,500,000 cycles wide. A television system capable of producing an image comparable to a good 5″ by 7″ photograph, then, would be required to transmit information at *over one thousand times the rate needed for telephony*. No electrical system which has yet been built is capable of transmitting so enormous a range of components with anything approaching uniform efficiency.

In recognition of these facts, all television systems which have been attempted to date are designed on the basis of reproducing an image far inferior to that which we have used as a typical example in still picture transmission. Although there has been considerable variation between the several systems so far developed, in no system has the reproduced image surpassed in detail an ordinary news print portrait one inch square. Such images are composed of approximately 50 scanning lines instead of the 700 thought desirable for a single still picture. On this basis the effective number of elementary areas is 2,500 and the information index number is 1,200 — less than for a single spoken word. At 20 images per second, however, even this crude reproduction necessitates the transmission of information concerning 50,000 elementary areas per second and gives to the highest component a frequency of 25,000 cycles per second.

By a drastic sacrifice in the quality of the reproduced image we have succeeded in reducing the rate at which the electrical transmission system must handle information until now it is only a little over ten times the rate required in telephony.

TABLE I

This shows the relative amounts of information contained in the various forms of information listed. These are orders of magnitude only; in each form a wide spread will be found in practice.

	Index Number
One word in telegraph code	15
One spoken word — as transmitted by telephone	1,800
One normal 5″ by 7″ photograph	175,000
A television image — present state of the art	1,200

With these several index numbers before us, we are ready to examine the information-carrying capacity of representative electrical communication channels. These are indicated, in accordance with (*Continued on page 32*)

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CO-OPERATIVE ORDERS

THE Co-operative desires to make some explanation regarding its "Order System." The Co-operative Society has gradually developed arrangements with mercantile establishments of high standing in Boston, whereby orders from the Society may be presented and honored at these stores. This method possesses obvious advantages, particularly to members with families, and it is maintained very largely for their convenience.

It enables members to make purchases of goods which the Co-operative does not carry in stock and to secure dividends upon such purchases at regular prices. Further information will be given gladly at the Cashier's window.

RULES AND REGULATIONS

Orders may be secured at the Society's store. These orders will be honored at the stores designated thereon, and the goods delivered as instructed, and charged to the Co-operative. A dividend is given on these purchases.

Orders must be obtained before making selections, since merchants invariably refuse to credit the Society with the sale unless the order is immediately presented. Orders mailed upon request to charge customers.

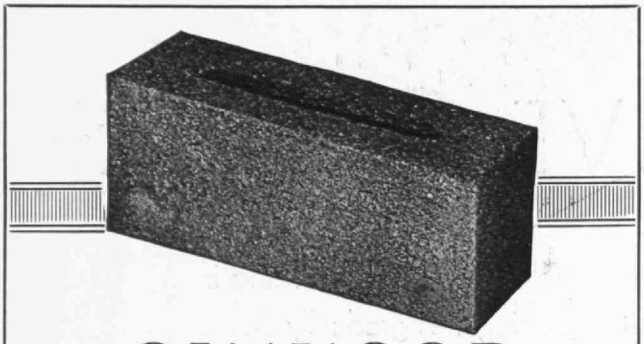
The following is a partial list of houses upon which orders must be obtained

A. G. Spalding	Athletic Goods
Wright & Ditson	Athletic Goods
Simmons Co.	Beds
Jones, McDuffee & Stratton	Crockery
Barker Shirt	Custom Shirts
Dame, Stoddard & Co.	Cutlery
Graybar Electric Co.	Electrical Goods
Geo. H. Wahn Co.	Electrical Goods
Milhender Electric Co.	Electrical Goods
Peck & Hills	Furniture
Rapids Furniture Co.	Furniture
Spaulding & Riedel Inc.	Furs, Cold Storage
Thomas Long Co.	Jewelry
D. C. Percival	Jewelry
London Harness Co.	Leather Goods
E. L. Ham & Co.	Rugs and Carpets
C. C. Bailey Co.	Rugs and Carpets
Artloom Rug Mills Co.	Rugs and Carpets
Ward's	Stationery
Thorp & Martin Co.	Stationery
Jones, Peterson & Newhall	Women's Shoes
T. E. Moseley	Women's Shoes

Technology Branch

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LOOKING 'ROUND THE CORNER

(*Continued from page 30*)

our first theorem, by the frequency range of the harmonic components which are transmitted with approximately equal efficiency. Several important examples are listed in Table II.

TABLE II

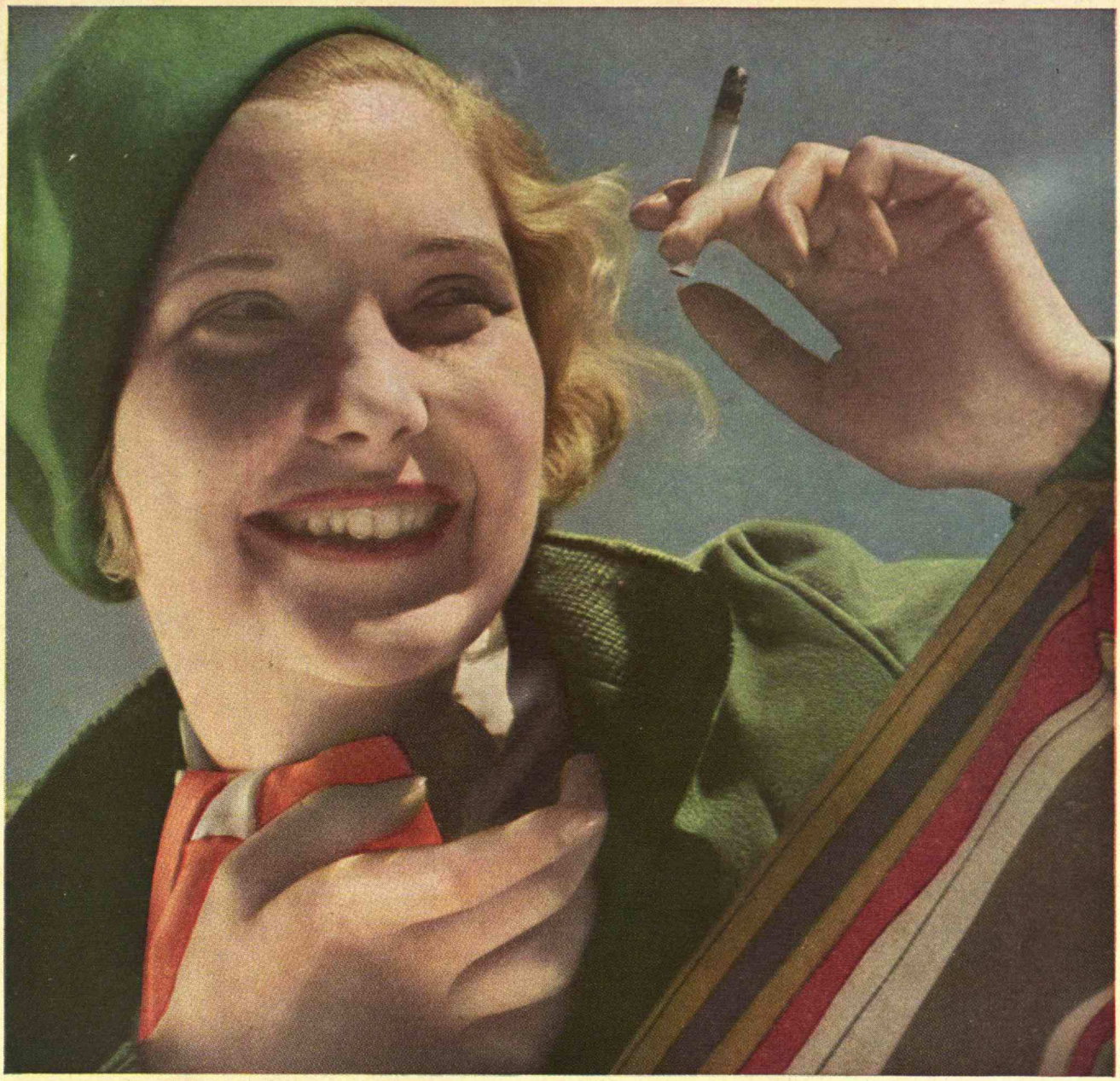
This shows the relative information-carrying capacity of various forms of electrical communication channels. As in Table I the values given are representative rather than rigorously accurate.

	Width of Frequency Band in Cycles per Second
Early Forms of Transatlantic Cable	15
Present High-Speed Transatlantic Cable	125
Subscribers' Loop Connecting to Central Office	3,000
Toll Cable Circuit	2,800
Open Wire Line — Equalized	30,000
Transatlantic Radio Telephone Channel — Long-Wave	3,000
Radio Broadcast Channel	10,000
Short-Wave Broadcast Channel	150,000

It is apparent that there is an enormous difference in information-carrying capacity between the various electrical communication channels now in daily use. The fastest transatlantic cable, for example, can handle approximately 500 words of telegraph code per minute; it is totally inadequate for telephonic transmission. Open wire lines, on the other hand, which are capable of transmitting frequencies up to 30,000 cycles per second, have a capacity which permits them to be loaded with a large number of telephone conversations simultaneously, or with an even greater number of telegraphic messages. But this is another story.

THE important conclusions for our present study of the outlook for television may be obtained directly from the above figures. We see at once, for example, that there is no likelihood of attaching to our present telephone instrument some simple gadget which will exhibit before us an image of the person at the other end of the line. Not only is the circuit connecting us with the central office already loaded to capacity with the speech transmission, but it fails by a factor of at least 10 of having the information-carrying capacity needed for even the crudest form of television image. Nor can we forget the fact, in considering communication between two individuals, that while in telephony we are willing to take turns in consigning our aural messages to the electrical channel, it is doubtful if we should be willing to take turns in looking at each other. Hence, in addition to the simple gadget so naïvely anticipated by many, it is apparent that our present telephone circuits would have to be supplemented by the equivalent of two additional circuits, each having at least ten times the present information-carrying capacity.

The situation appears somewhat more hopeful with respect to broadcasting. Here channels are available having much greater information-carrying capacity and transmission in but a single direction is required. When, however, we are told that shortly we shall be able to buy a simple addition to our present broadcast receiver, by the use of which we shall see (*Concluded on page 33*)



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LOOKING 'ROUND THE CORNER

(*Concluded from page 32*)

everything that is taking place in the studio, we must remember, first, that each of the present broadcast channels is already working at maximum capacity to bring us the audible information and, second, that the television signal which could be transmitted by the best present broadcast channel would produce an image having so little detail as to be practically valueless. It would appear from an inspection of the relative message-carrying capacities of various channels that the logical vehicle for television images is to be found in the short-wave transmission. Indeed, it is here that the most promising practical results have been obtained.

We have, then, looked around the corner and have obtained some idea of the magnitude of the transmission problem involved in television. We must, however, retain our confidence in the engineer and in the scientist, knowing that they have never yet been deterred by mere magnitude. We may be certain that in due time channels of considerably greater information-carrying capacity than any now available will be provided. We must remember, nevertheless, that the burden is greater than anything which any communication channel has yet been asked to bear and that the price must be paid, either in correspondingly higher charges for the service or in the cost of the development work necessary to provide this service at a lower charge.

You are now left with the second half of the problem; that of deciding for yourself how much you want television.

THE FUTURE OF EMPLOYMENT IN THE ENGINEERING PROFESSION

(*Continued from page 12*)

paragraphs. How, then, did the engineering profession survive those earlier panic periods? Probably the profession had a casualty record comparable with other business groups, but we know that it survived and prospered in pace with the nation's development.

In his "Epic of America" James Truslow Adams analyzes the influence of the pioneer spirit on the American people. A geographical frontier constantly advancing westward colored and invigorated American thought and stamped into our fathers the idea that our future was boundless. About 1890, however, the "infinite West" became finite, and we became a nation without a frontier. But the pioneer spirit still persisted and turned back from the Pacific to find new and non-geographical frontiers to develop and push outward.

Is not the present period the time for the engineering profession to remember that there is still an engineering frontier? When in past depressions men found themselves at a stalemate in the settled communities of the country, they acquired a covered wagon and emigrated to the geographical frontier. And so today the engineering profession, stalemated by the depression, must turn to its frontier — the "infinite West" of *engineering research.*

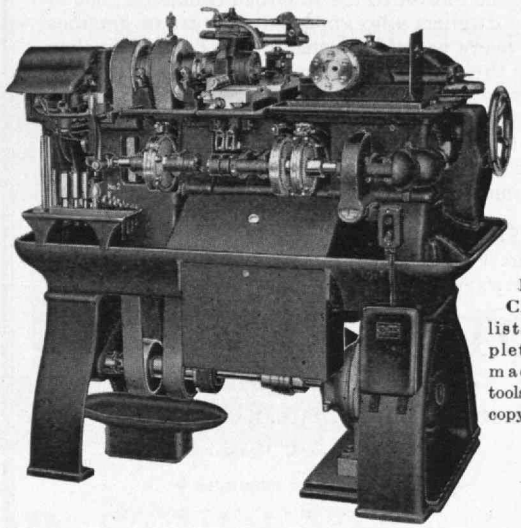
(*Continued on page 34*)

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THE FUTURE OF EMPLOYMENT IN THE ENGINEERING PROFESSION

(Continued from page 33)

Let me list a few of the opportunities that challenge the engineer on this frontier.

In the power field we may anticipate further advance in the many modern developments toward the production of power at lower cost. The improved utilization of fuels, which has raised boiler plant efficiencies from the range 55%–60% to 85%–90%, will result in large replacements of obsolescent equipment by new. Materials such as oil refinery sludges that once were treated only as waste are now being burned economically.

Still greater appreciation of the advantages of by-product power may be expected in the general effort toward low production costs. We may anticipate a superseding of present small plant equipment by turbo-generator units taking steam at high pressures and superheats, allowing extraction at pressures adequate for general plant drives such as fans, pumps, and so on, which in turn will exhaust at low pressures for process work and heating.

The automatic control of power generating and distributing systems has shown economies which promise further extensions in this field. This also applies to the development of high efficiency, high power factor motors. In the hydroelectric field, the present success of the adjustable blade turbine would indicate that the high efficiencies over a wide range obtaining with this type of wheel will result in its more general adoption.

Stationary internal combustion engines have proved their reliability and their economy for many installations. The field for such prime movers in the isolated plant is great.

Many manufacturers are still to be convinced of the economies of such power possibilities as outlined above. The public also must be made to recognize that actual building and equipment design constitutes a small part of the consulting engineer's function, and it must be made to recognize that the engineer deals as much in the dollar as in the sack of cement and the kilowatt. There are undoubtedly hundreds of industrial plants which are faced with immediate changes in their power arrangements just as soon as they secure even a moderate proportion of a normal volume of orders. The power engineer who can convince the manufacturer of the economies of such changes and is qualified to execute them properly need not fear a low volume of business.

Future possibilities, of course, are not limited to the power field. The heating and ventilating engineer should realize that the public has not begun to take full advantage of modern developments in this branch of engineering, such as more precise control of the comfort factors of temperature, humidity and air circulation and more efficient steam heating boilers and radiation. Further possibilities of advancement in other engineering branches could be enumerated, such as the all-metal building, non-corrosive metal façades and high strength aluminum alloys in structural work, the development of electric cooking (*Concluded on page 36*)



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THE FUTURE OF EMPLOYMENT IN THE ENGINEERING PROFESSION

(*Concluded from page 34*)

and heating, still more impressive contributions to be expected of the chemical engineer and the aviation technician, but it is unnecessary to outline further salients in the engineering frontier.

The answer to the question, "How will the engineer function in the ensuing business recovery?" is as follows:

The country after this latest periodic set-back will continue to advance in the creation of more and more comfortable living conditions for more and more people, and the engineer will perform his usual function in such advancement. He will continue to create more attractive buildings, more economical manufacturing equipment, and household living facilities that are cheaper in cost and operation and provide enhanced comfort. As in the past, old and less attractive buildings, less economic manufacturing equipment, and household facilities of lesser convenience will give place to structures and services of greater economy and comfort.

The law of obsolescence still governs. The new will replace the old and the nation and its engineers will prosper.

ECLIPSE — 1932 STYLE

(*Concluded from page 11*)

for the August 1932 eclipse, the reason being that it occurred in a portion of the sky containing very few suitable stars. The planets Jupiter and Mercury were nearly in line with the sun but of course not suitable for this test.

The weather, particularly in the region selected by most observing parties, for August 31 is too recent a subject to require mention. The majority of the expeditions saw nothing, and it is too early to learn the final results of the few fortunate groups. Corona photometric studies certainly will be available and the Japanese seem to have been successful in photographing the flash spectrum, and made corona measurements as well. The mistaken first newspaper report that they had discovered a new element in the flash spectrum was promptly and emphatically denied. F. deRoy, a Belgian variable star observer, went up 10,000 feet in an autogiro above the Maine coast, and while it hovered, nearly at rest, measured the corona visually and found streamers extending to one and a half solar diameters beyond the edge of the sun.

For completeness one must mention that Mount Wilson observers have, under unusually good atmospheric conditions, very occasionally been able to photograph the flash spectrum without an eclipse and Lyot in France has very recently been able to observe the corona from a high mountain, but it would seem for the present at least that the principal studies on these two subjects will still have to be made at eclipse time. Of course, many features on the surface of the sun can be studied without waiting for eclipses. George Ellery Hale, '90, for many years director of the Mount Wilson Observatory, has been a leader in this field. His spectroheliograph and spectrohelioscope studies of the surface of the sun, as seen in monochromatic light, have added much to our knowledge of sun spots, and of convection currents in the sun's atmosphere.

For future eclipses, one might offer a watchword of bigger and better spectrographs. The increased sensitivity of modern photographic plates should make available a wealth of new material, particularly in the red and infra-red part of the spectrum. Preparation for eclipse measurements involves months of labor, and the results if successful require months of study before final conclusions may be drawn. Sometimes the observers must travel to remote parts of the globe for a minute or two of observation, and then a stray cloud may thwart them completely. But much has been learned in the past by such measurements and surely much more remains to be discovered.

Some of the material of this article is drawn from the admirable book "Eclipses of the Sun," by Professor S. A. Mitchell of the University of Virginia (Columbia University Press), the third edition of which has just been published. For further information readers are referred to it.

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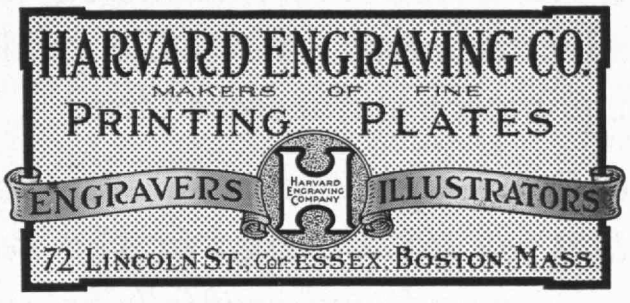
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M. I. T. NEWS BULLETIN

PREPARED BY JOHN J. ROWLANDS, DIRECTOR, INSTITUTE NEWS SERVICE

Growth an Index of Child Health

That growth of children is an important indication of health is revealed in a careful study of the growth rate of 1,000 school children recently completed by the Health Education Research Laboratory of the Institute.

This investigation of intermittency in growth as an index of health status was made by Dr. Clair E. Turner '17, Professor of Biology and Public Health, with Dr. Charlotte Winnemore and Miss Ellen Lytle. The study showed a direct relation between intermittent growth in children and illness, physical defects, and unhealthful habits of living.

The children studied were pupils in the public schools of Malden, Mass., where for several years school officials have coöperated with Dr. Turner in a program of health education. The group under observation ranged from six to 12 years old.

Study of monthly weight records revealed that children who stopped growing for long periods of time had a distinctly poorer health status than those who gained at least every two months. Less than two per cent of the children were found to gain weight every month of the school year. In this connection Dr. Turner pointed out that it is not to be expected that a child will gain in weight every month.

In a group of children who had failed to gain over a three months' interval, compared with a group of regularly gaining children, three times as many were found with important unhygienic habits, twice as many with serious physical defects, and twice as many who had had recent illness. The number who were defective in two or all three of these respects was more than four times that in the regular growth group.

The report urges that special attention be given to children whose growth record shows failure to gain for three months or more. The study also endorses the public school program of weighing children every month in order to stimulate their interest in growth and healthful living.

The Health Education Research Laboratory of the Department of Biology and Public Health was the first agency to point out, some years ago, the fallacy in attempting to get all children "up to weight." By means of studies of school children and mathematical analyses of the reliability of underweight measurement, they showed conclusively that relation to average weight is not a direct index of health, and that healthful living stimulates the growth rate without fundamentally changing the bodily proportions of the child.

Freshman Scholarships

The award of 15 competitive freshman scholarships was announced at Technology during the summer. The recipients of the scholarships, which are given on the basis of high quality entrance examination records, were: John A. Bartol, Roxbury, Frank R. Berman, Brighton, Richard U. Bryant, Allston, Haskell Norman, Dorchester, and Walter J. Lane, Boston, all graduates of Boston Public Latin School; Norman G. Bull, Washington, D. C., Friends School; Sidney Cornell, Jr., Quincy, Mass., Thayer Academy; Warren V. Eaton, Jr., St. Louis, Mo., St. Louis Country Day School; Harold W. George, Plains, Pa., Wyoming Seminary; David J. Gildea, Jr., Plainfield, N. J., Plainfield High School; Martin A. Gilman and James C. Turnbull, Hartford, Conn., Hartford Public High School; Max Saslaw, Malden, Mass., Malden High School; Louis C. Smith, Jr., Larchmont, N. Y., Mamaroneck High School; and Milner W. Wallace, Lafayette, Ind., Phillips Exeter Academy.

The number of applications for the competitive freshman scholarships was more than double the number in 1931.

Textile Research

With the opening of the school year, three of the five Technology men appointed research fellows by the Textile Foundation last spring will commence activities at the Institute.

Under the direction of Professor Edward R. Schwarz '23 of the Department of Mechanical Engineering, G. Gordon Osborne will investigate the microanalysis of fibers. He will study the latest designs in microscopes, particularly one which uses incident rather than reflected light, and will establish an improved technique for preparing cross-sections of various textile fibers for study by means of stereoscopic photomicrographs. Mr. Osborne's work is definitely correlated with textile research now being sponsored by the Textile Foundation at the University of Chicago and Cornell University.

A problem of immediate interest to the dye and textile industries, the spectrophotometric analysis of dyed materials, will be undertaken by Orrin W. Pineo '29, in the Technology laboratory for color measurements. Mr. Pineo will work under the direction of Professor Arthur C. Hardy '18 of the Department of Physics.

Bryce Prindle '31 will study the microbiology of textile fibers, which includes the types and effects of moulds, fungi, and bacteria attacking yarns and materials. His research will be conducted under the supervision of Dr. Samuel C. Prescott '94, Dean of Science.

John B. Calkin and Bernard S. Gould '32, also appointed Textile Foundation research fellows, are carrying on advanced studies at Cornell University and the University of London, respectively. R. L. Steinberger of Harvard University will work in coöperation with the Institute's textile research laboratory, and in consultation with Professor Schwarz.

A notable addition to Technology's unusually complete facilities for textile study has been made in the form of a new device for making stereograms of textile materials. Developed at the Institute by means of funds from the Textile Foundation, the apparatus makes possible the photographic study of fabrics in three dimensions, with or without the aid of a microscope and without the use of much special equipment formerly employed. So far as is known, the instrument is the first of its kind in use in an educational institution.

The unique abstract service carried on by members of the laboratory staff for publication in the *Bulletin* of the United States Institute for Textile Research and for the laboratory's own files will be continued throughout the year. This service, instituted by the late Dr. Samuel W. Stratton, now covers 60 foreign and domestic periodicals, and forms the most complete survey of current scientific literature made in the textile field in this country.

National Research Fellows

This fall Technology welcomes a group of seven National Research Fellows who have chosen the Institute at which to conduct advanced physical and chemical research.

Under President Compton's supervision, Dr. Norris E. Bradbury of the University of California will study the mobility of alkali metal ions in the rare gases, and Dr. Edward W. Samson, Princeton, will investigate nuclear structure problems with high voltage protons.

Dr. Isadore Amdur, University of Pittsburgh, plans a study of the kinetics of reactions involving atoms and radicals, under the direction of Professor Frederick G. Keyes, Head of the Department of Chemistry. Professor Keyes will also guide the research of Dr. John L. Oncley, University of Wisconsin, in the frequency variation of the dielectric constant.

With Professor John C. Slater, Head of the Department of Physics, as supervisor, Dr. William W. Hansen of Stanford University will study quantum mechanics; Dr. Theodore E. Sterne, Cambridge, England, vapor pressures and entropies (statistical mechanics); and Dr. Rolland M. Zabel, University of Iowa, the scattering of molecular beams.

The National Research Fellowships are supported by the Rockefeller Foundation, and administered by the National Research Council to students of exceptional promise who have secured the degree of doctor of philosophy. Last year some 60 National Research Fellows carried on advanced studies in physics, chemistry, and mathematics in this country and abroad. Since the beginning of the fellowship program in 1919, nearly 350 men have received appointments.

Among the past National Research Fellows now members of the Institute staff are Professor Ralph D. Bennett of the Department of Electrical Engineering; Professors George R. Harrison, Philip M. Morse, and Victor Guillemin, and Drs. Robert J. van de Graaff and John C. Wulff of the Department of Physics; Professors James A. Beattie '17, George Scatchard and Louis Harris '20, and Drs. Nicholas A. Milas, Charles E. Teeter, and J. G. Kirkwood of the Department of Chemistry; and Professor Jesse Douglas of the Department of Mathematics.

Summer Notes

President and Mrs. Compton and their children returned to the Institute on August 29 after spending the summer at Otsego Lake in Michigan. Dr. Compton joined them there following his journey to Corvallis, Ore., where on June 29 and 30 he attended the meetings of the Society for the Promotion of Engineering Education.

During the summer, Vice-President Vannevar Bush was in charge of affairs at the Institute, and spent his leisure time with his family at their summer home on Cape Cod. They returned to their home in Belmont early in September.

On Sunday, July 24, President Compton was the guest of the Alumni of Michigan at their reunion at Cranbrook School in Bloomfield Hills. To this well-attended and enthusiastic reunion came a group of Technology men from Toledo, Ohio. John H. Little '23, President of the Detroit Technology Association, was in charge of the gathering and introduced Dr. Compton when he spoke to the alumni on the importance of fundamental training in science and engineering.

President Compton returned to the East in time to witness the total eclipse of the sun on August 31. To be near the center of the path of totality, he went to Douglas Hill, Me., and was the guest of Orville B. Denison '11, who operates the Douglas Hill Inn.

Scholastic Standings

For the second successive year, comparative scholastic standings have been computed for activity and non-activity groups, the detailed results being shown in the adjoining tabulation. Definite improvement is to be noted particularly in the averages of activity men.

The general average of all undergraduates as of June, 1932 moved 0.02 points to 3.11 as compared with June, 1931, and the average of dormitory residents rose 0.08 to 3.23. However, the average of activity men moved upward 0.154 to 3.36 and the average of fraternity men increased 0.17 to 3.10 during the period.

Of 22 activity groups, 16 improved their standing while six experienced a decline; and of 27 fraternity groups, 18 improved, and seven declined.

COMPARATIVE SCHOLASTIC STANDINGS OF UNDERGRADUATE ACTIVITY AND FRATERNITY GROUPS
(as of end of Second Term 1931–32)

	Average	*Increase Over June, 1931*	*Corresponding Rank — June, 1931*
1. Tau Beta Pi	4.07	0.312	1
2. The Tech Management	3.979	0.539	7
3. Officers' Combined Professional Societies	3.621	0.151	5
4. Phi Beta Delta	3.62	0.35	15
5. Benchmark Management	3.61	0.12	4
6. Voo Doo Management	3.59	0.319	14
7. Technique Staff	3.57	0.76	43
8. T. E. N. Management	3.56	*0.07	2
9. Officers of the M. I. T. A. A.	3.54	0.57	35
10. T. C. A. Cabinet	3.525	0.225	13
11. Dramashop Management	3.520	0.38	22
12. Dormitory Committee	3.45	0.099	9
Average of the 164 men holding managerial and executive positions in activities	3.448	0.181	
Average of the 153 men engaged in publication activities	3.386	0.174	
13. Alpha Kappa Pi	3.37	0.33	29
Average of the 417 men in 22 activity groups	3.36	0.154	
14. Kappa Sigma	3.36	0.28	26
Average of the 293 men on the Staffs of activities but not holding managerial or executive positions	3.347	0.183	
Average of the 79 men engaged in dramatics and musical activities	3.331	0.263	
15. Combined Musical Clubs Performers	3.33	0.13	19
16. Phi Sigma Kappa	3.32	0.74	51
17. Sigma Alpha Epsilon	3.28	0.19	24
18. Wearers of the Varsity Athletic Insignia other than "T"	3.277	0.037	16
19. Tau Delta Phi	3.27	**	
20. T. E. N. Staff	3.270	*0.18	6
21. The Tech Staff	3.243	0.033	18
22. Lambda Chi Alpha	3.24	0.23	30
23. Technique Management	3.232	*0.118	10
24. Alpha Tau Omega	3.23	0.389	41
Average of the 472 Dormitory Residents	3.23	0.08	
25. Chi Phi	3.22	0.24	33
Average of the 175 men engaged in athletic activities	3.216	0.003	
26. Sigma Chi	3.21	0.02	20
27. Beta Theta Pi	3.19	0.348	40
28. Delta Psi	3.15	0.51	49
29. Wearers of the "T"	3.139	0.059	25
30. Phi Gamma Delta	3.13	0.17	37
31. Theta Delta Chi	3.13	0.29	42
32. Combined Musical Clubs Management	3.126	0.536	50
33. Institute Committee	3.12	*0.26	8
GENERAL AVERAGE ALL UNDERGRADUATES	3.11	0.02	
Average of the 622 members of the 27 social Fraternities. (Does not include Tau Beta Pi)	3.10	0.17	
34. Voo Doo Staff	3.088	0.208	39
35. Varsity Sports Managers	3.080	*0.07	21
36. Phi Mu Delta	3.07	*0.06	23
37. Sigma Nu	3.05	0.00	28
38. Psi Delta	3.05	0.26	44
39. Varsity Sports Captains	3.04	*0.57	3
40. Theta Chi	3.03	0.27	46
41. Phi Kappa Sigma	3.01	0.24	45
42. Sigma Alpha Mu	2.99	*0.24	17
43. Phi Iota Alpha	2.99	0.33	48
44. Theta Xi	2.95	0.53	52
45. Delta Tau Delta	2.92	*0.05	36
46. Phi Beta Epsilon	2.92	*0.08	31
47. Delta Upsilon	2.88	*0.09	34
48. Delta Kappa Epsilon	2.83	*0.24	27
49. Phi Kappa	2.56	*0.12	47

* Decrease
** Not rated in June 1931

ADVERSARIA

Approbated

¶ Pierre S. du Pont '90, by receiving the medal of the Pennsylvania Horticultural Society for the greenhouses and landscape development he has created at his home. He is considered to have the finest private horticultural collection in the world.

¶ Otto B. Blackwell '06, by receiving the 1931 A.I.E.E. national prize for the best paper on engineering practice, prepared jointly with H. L. Will, entitled "Status of Joint Development and Research on Noise Frequency Induction." Mr. Blackwell entered the engineering department of the American Telephone and Telegraph Company on graduating from M.I.T. and in 1915 was placed in charge of transmission and protection.

¶ Vannevar Bush '16, by receiving an honorary Doctor of Science degree from Tufts College with the following citation: "Alma Mater's honored son! Whose achievements in the field of electrical engineering are exceeded only by his devotion to pure science; whose inventive genius has transferred to a machine the burden of mathematical calculations which heretofore weighed down and often thwarted the efforts of research; whose rare gifts as a teacher enable him to inspire as with his own enthusiasm the graduate students who throng to him from all parts of the country."

¶ F. Alexander Magoun '18 and Eric F. Hodgins '22, by having their book, "Behemoth; the Story of Power," placed on the Chicago *Journal of Commerce* list of the best 100 books of the year. It was also an April book club selection.

¶ Benjamin L. Smith '30, by receiving the A. W. Brown Scholarship of $2,000, to be used for a year of travel and study in Europe. After a year in the architectural school of the University of Illinois, he was given a special student scholarship to M.I.T. and upon returning to Chicago entered the Atelier Adams-Nelson, where he has made the best record of any student there. During the Beaux-Arts season of 1931 and 1932, he submitted seven projects, six of which were awarded medals. He is also the winner of the 1932 Warren prize. In 1930, Mr. Smith passed the Illinois State Board examination for the Registration of Architects with the highest general average of that class.

¶ Frederick M. Moss '32, by receiving the American Institute of Architects medal for highest scholastic work during the five years at Technology. He received the Rotch award with a stipend of $200 for the regular student with the highest grades and also was the first recipient of the Alpha Chi Rho Medal of Course IV "given to the student of the graduating class who had done the most for his school during his five years."

Olympic Fencing Honors

¶ To Joseph L. Levis '26, who took second place in the individual foils competition, thereby giving the United States the highest honor it has ever been able to win in an Olympic fencing competition.

Appointed

¶ John H. Gregory '95, to the Advisory Board of the Reconstruction Finance Corporation, to assist in passing upon the merits of all self-liquidating construction projects which it will be asked to aid under provisions of the emergency relief act. (See class notes for complete account.)

¶ Emory S. Land '06, chief of the Bureau of Construction and Repair of the Navy, which gives him the rank of Rear Admiral. During the World War he received the Navy Cross from President Wilson for his work in the designing and construction of submarines. He was one of the American members of the Allied Naval Armistice Commission.

¶ Richard G. Tyler '10, head of a reorganized unit of the technical and professional colleges of the University of Washington. He now has charge of all engineering, including mining and ceramics, forestry, pharmacy, and military and naval science, the old colleges becoming departments.

¶ Wilhelm Kupferburger '24, Assistant Director of the Geological Survey. Born and educated abroad, Dr. Kupferburger was given a year's leave of absence from Witwatersrand University, where he was a lecturer in Geology, to study commercial geology at M.I.T. Five years ago he obtained a research bursary to investigate the uses and treatment of the baser minerals found in South Africa and to study the economic side of their production. He obtained the degree of Doctor of Science at Witwatersrand University. In 1929, he was appointed Mineral Technologist in the Trade and Industries Division of the Department of Mines and Industries.

Affiliation

¶ On September 1 Donald G. Robbins '07 became associated with William H. Coburn and Company (W. H. Coburn '11), Boston investment counsellors. For the past two years Mr. Robbins has been Vice-President of the Alumni Association and for many years a member of the Alumni Council and of the Advisory Council for the Musical Clubs. For more than a decade he has been associated with Hornblower and Weeks' statistical and engineering departments. Mr. Coburn is likewise a member of the Alumni Council and of its Executive Committee.

In the News

¶ Louis A. Brown, Jr., '19, for designing and supervising the modernistic unit of the Childs Company restaurant in the R.C.A. Building recently completed. Mr. Brown has achieved unusual reputation and leadership in restaurant layout and design. He recently designed Alice Freeman's Tavern in Scarsdale.

¶ Kenneth T. Bainbridge '25, for having succeeded in measuring to an extraordinary degree of accuracy the weight of the recently discovered hydrogen 2, the heavy hydrogen atom. His announcement was made to the 180 scientists and research workers in speculative physics and chemistry assembled at Yale for the 179th meeting of the American Physical Society. The discovery of the heavy hydrogen atom was announced in December and a sample handed over to Dr. Bainbridge, of the Bartol Research Foundation, to ascertain its weight. Using the mass spectrograph, he found that the mass of this new atom was less than that of the two ordinary hydrogen atoms of which it was made up. The loss in this mass, according to other scientists at the meeting, might be placed at 2,000,000 electron volts. Dr. Bainbridge believes, and his colleagues at the meeting agree, that his measurements display an error of only one two-thousandths of one per cent.

¶ William B. Lodge '30, for his invention of an ultra short-wave transmitter which can send television images and sound simultaneously on the same wavelengths. The new invention is termed "double-modulation."

Written

¶ By William Z. Ripley '90, a series of articles on railway problems in the press under date of June 20 to 23. Also an article on Public Utility Insecurities in the August issue of *Forum*.

¶ By Frederick C. Gilbert '98 and Carl J. Trauerman '07, an article on "Treatment and Shipment of Gold Ores in the Boulder Batholith Mining Districts of Montana" in the *Montana Oil and Mining Journal*.

¶ By Stuart D. Chase '10, a book entitled "A New Deal," published in August by the Macmillan Company.

¶ By Edward P. Warner '17, "Aviation Handbook" in collaboration with Paul Johnston, assistant editor of *Aviation*.

¶ By Henry M. Lane '21, a paper on "A Resistance-Capacitance Coupled Amplifier in Television," which appeared in the April, 1932, issue of the *Proceedings* of the Institute of Radio Engineers.

¶ By G. Everett Farmer '22, an article in a recent issue of *Electrical World* entitled "Miniature Control of Substations."

¶ By RICHARD H. FRAZIER '23, an article entitled "Further Data on the Thermal Diffusivity of Nickel," which appeared in the *Physical Review* for May 15, 1932.

Retired

¶ CHARLES D. JENKINS '82, from the Utilities Department's bureau of gas, electric, and water utilities, after a service of 44 years.

¶ THEODORE W. ROBINSON '84, from active service as Vice-President of the Illinois Steel Company, on June 7. (See class notes for full account.)

First Solo Blind Flight

¶ By Captain ALBERT F. HEGENBERGER '17, Army Air Corps. Seeing nothing but the instruments before him from take-off to landing, Captain Hegenberger successfully made the first attempt at blind solo flying. Three years ago James H. Doolittle '24 landed blind with a check pilot aboard to take over the duplicate controls in case his skill failed or his calculations went awry. Hegenberger used radio to guide him into the field, to mark for him the point at which to begin his glide and to warn him when he neared the field boundary. He employed a supersensitive altimeter to indicate his altitude above the landing area. The other flight instruments were normal.

Memorial

¶ To TAKUMA DAN '78. The family of the late Baron Dan, Director General of the Mitsui Gomei Kaisha until his tragic death in March, 1932, has reproduced for his friends the late Baron's last writing and speech in the hours preceding his death. These have been bound in a beautiful edition, together with several pictures of the Baron in the company of the members of the Commission of Inquiry of the League of Nations, with whom he spent the last few hours of his long life of achievement and service.

Recent Deaths

Reports have come to The Review since the last issue of the decease of the following:

¶ ARTHUR H. PEARSON '70, in May. Professor Pearson was prominent in educational and Congregational activities in the Northwest. His first teaching position was as an instructor in chemistry at Harvard University. He went to Carleton College in 1880 and was one of a group of New Englanders who pioneered in the upbuilding of that college, where he was professor of philosophy for 20 years.

¶ HARRY F. FAY '71, at Poland Springs, Maine, on August 10. After graduation from Technology Mr. Fay engaged in business, later taking up the profession of music and gaining a prominent place in Boston musical circles. Since 1896 he has been connected with the copper mining industry at Lake Superior, being president and director of a number of mining companies.

¶ EDWARD R. BENTON '85, in Newton Centre, Mass., on August 29. Mr. Benton was known as an architect identified with the construction of the Boston Public Library and the Johnson Gate at Harvard and formerly a member of the United States Geological Survey.

¶ FREDERICK H. NEWELL '85, one of the founders of the United States Reclamation Service, on July 5, after a heart attack in his office. He was the author of many engineering works and his most recent work, "The Planning and Building of the City of Washington," was the contribution of the Washington Society of Engineers, and of engineers generally, to the Bicentennial celebration. He was one of the founders and the first secretary of both the National Geographic Society and the American Forestry Association as well as one of the founders of the American Association of Engineers.

In 1888 he became connected with the United States Geological Survey and in 1902 he was made chief engineer of the Reclamation Service. Resigning from Government service in 1915, he went on a lecture tour for two years, after which he was named head of the Civil Engineering Department at the University of Illinois, where he remained for five years, also continuing as consulting engineer for the Reclamation Service. Returning to Washington in 1923, he established a consulting practice, and shortly afterward the Research Service, Inc., with Allen B. McDaniel '01. He was head of this company at the time of his death.

¶ JAMES E. R. CARPENTER '87, in June. Mr. Carpenter was a well-known New York architect and has been called the father of the modern large apartment.

¶ WILLIAM W. UNDERHILL '89, in Brookline, on June 4. Immediately after graduating from the Institute, Mr. Underhill entered the employ of the Smead Heating and Ventilating Company of Boston and remained with them until their removal to Colorado in 1894. That year he became associated with the Fuller and Warren Heating and Ventilating Company of Troy, N. Y., his former chief competitor, first as a salesman, then as manager of the Boston office, which included the New England States.

In April, 1910, the Stone-Underhill Heating and Ventilating Company of Boston was formed, which was sole New England agent for the Fuller and Warren Company's schoolhouse apparatus. Mr. Underhill was made Treasurer.

He was affiliated with many fraternal organizations. In 1904 he was initiated into the Brookline Lodge of Elks and served as Treasurer for three years, chairman of the board of trustees for six years, and later was made a life member. He was a member of the American Society of Heating and Ventilating Engineers.

¶ FRANK H. THORP '89, in February. Dr. Thorp was an active member and one-time chairman of the Northeastern Section of the American Chemical Society. An anonymous donor, in appreciation of the service of Dr. Thorp in the field of chemical education and in gratitude for the kindly assistance and encouragement which he so readily gave those who sought his advice, has established at M. I. T. a fellowship in his memory to be known as the Frank Hall Thorp Fellowship in Industrial Chemistry.

¶ FRANCIS F. HUSSEY '90, at the Newton Hospital, on May 17, 1924.

¶ MRS. LOUIS J. PARIS (Addie E. Edwards) '90, on October 1, 1922.

¶ WILLIAM C. RICHARDSON '91, at Santa Cruz, Calif., on July 25. (See class notes for further details.)

¶ FRANK P. WILLIAMS '93, on June 18, at his summer home at Marblehead Neck. After graduating from the Institute he attended Harvard Medical School, where he received his M.D. in 1895. He then served as house officer of St. Elizabeth's Hospital in Brighton and later at the Post Graduate Hospital in New York. In 1897 he began private practice in Boston.

¶ GEORGE K. BURGESS '96, Director of the Bureau of Standards, on July 2. Secretary Lamont paid him the following tribute: "Entering the service of the government's scientific branch more than a quarter-century ago, by his ability and application Dr. Burgess advanced steadily from Assistant Physicist to Director of the Bureau. He was admittedly in the first rank of metallurgists of the country and his work in this field during the war won him nation-wide recognition.

"I can think of no more fitting characterization of Dr. Burgess than the recommendation given him by his predecessor, Dr. S. W. Stratton, which appears in the files of this department that he was 'thoroughly able, efficient, conscientious, and industrious.'" He received the degree of Doctor of Science from the University of Paris in 1901 with the highest commendation given with a doctor's degree. Experiments in 1904 by him and the late Dr. C. W. Waidner developed 25 years later into the Waidner-Burgess standard of light, making possible the accurate measurement of light. He also did notable work in pyrometry, laying the foundation for the new widespread use of high-temperature measurements in industry.

¶ WALTER H. BUTLER '99, in London, July, 1931.

¶ FLORIAN L. LACAFF '99, of pneumonia, in Phoenix, Ariz., June, 1931.

¶ EVERETT H. HINCKLEY '99, after an auto accident, April 29.

¶ ARTHUR NEALE '06, in May. (See class notes for brief account.)

¶ JOHN J. HYNES, JR., '09, at Buffalo, April 27.

¶ MARION H. FOSS '09, August 28, after a long illness. For the last three years, Mr. Foss had been consulting engineer for the United Chemical and Organic Products company of Calumet City. For seven years previously he had been a consulting engineer for Wilson and Company.

¶ GEORGE W. HARDING '14, at Richmond, Va., October 18, 1931.

¶ DONALD O. DUNN '16, at Cleveland, on June 17.

¶ DAVID L. JACOBSON '16, of Pittsburgh, on March 6.

¶ JAMES L. CLARK '18, at Lake Sunapee on August 12.

NEWS FROM TECHNOLOGY CLUBS

The Technology Club of Cincinnati

The summer season witnessed one of the club's largest turnouts when Colonel Henry M. Waite'90, Chief Engineer of the Cincinnati Union Terminal Co., invited all members in good standing to view Cincinnati's new railway terminal, now in course of construction. Full half a hundred were on hand to enjoy the Colonel's hospitality, filling two large motor coaches furnished by our host, who also acted as guide in one of the coaches.

The regular Tuesday Luncheon of June 21 was the beginning of the party and the unusual attendance overflowed the allotted section in the Bird of Paradise Room of the Hotel Gibson. Thence the way led to the offices of the Cincinnati Union Terminal Company, where the busses were boarded and the Technology trek got under way, taking in the entire terminal project from its south-end connections, near the Ohio River, to its northern extremities, over and under viaducts, bridges, and tracks into the bowels of the station and out on the rim of its dome. It was a most opportune time to look over the large field of operations from an engineer's viewpoint, as most of the work was in process of construction and materials and methods of installation could be readily observed to great advantage. Here it was that Colonel Waite, in accordance with the best principles of modern alchemy, had some few short months ago ceremoniously planted a pile of gold, then followed this by a short interval of judicious waving of hands, finally to show us the magnificent pile of stone of the new station building rising out of a neat plane of bustling activity, where formerly had been the stagnation and chaos of a large city dump. The attending members felt themselves in the middle of a great movement and expressed their appreciation of the opportunity that had been afforded them in this unusual preview.

All during the summer every Tuesday has seen some of our members at the luncheon table in the Hotel Gibson Bird of Paradise Room when we were honored, too, by having some of the undergraduates drop in on us with the last word from Technology. — WILLIAM V. SCHMIEDEKE'12, *Secretary*, The Penker Construction Co., 1030 Summer Street, Cincinnati, Ohio.

Technology Club of Lake Superior

Herewith are recorded the minutes of the meeting of the Club held at a noon luncheon on June 29, 1932, at the Hotel Duluth.

Present: Messrs. H. E. Lobdell, Dean of the Institute; J. R. Killian, Jr., Editor of The Technology Review; H. J. Pearl, President of the Club; W. B. Driscoll, W. R. Peyton, Dr. C. J. Muller, W. C. Maddox, President of the Duluth Engineers' Club; three undergraduates, John Rumsey, H. A. Carmichael, Mr. Oldenburg; and the Secretary. Twenty-four notices of the meeting had been sent out but absences and business engagements reduced the attendance to the above list.

On request of President Pearl, Dean Lobdell gave a general review of present activities and new policies which the Faculty has in view. Most striking to an old-time alumnus is the experiment of admitting men of high standing without examination. (The Secretary was "born 40 years too soon.") — Mr. Killian spoke of the very satisfactory progress that is being made by The Technology Review. Its general make-up and contents place it in the front rank of semi-scientific publications that can be enjoyed by the lay reader as well as by the scientist. A financial and statistical statement was distributed giving figures of interest regarding the Alumni Association.

The Dean and Mr. Killian were en route to the Pacific Coast by motor and planned to reach Los Angeles about the end of July, there to attend an educational convention. These occasional visits of Faculty members of the Institute give us about the only contact with our Alma Mater and we are always glad to hear from them the progress that is being made by this great institution.

Following the meeting the Secretary had the pleasure of driving our guests, including also Messrs. Pearl and Driscoll, over the circuit of the Boulevard, Morgan Park, Superior, and return to Duluth.

We had looked forward to a visit by two representatives of the Institute, the Dean and the Editor of The Review, who in their official capacity would uphold the dignity of the Massachusetts Institute of Technology. This they did, but when we said good-bye to Lobbie and Jim we felt that we had made a very personal re-contact with Old Tech, changed indeed from the days when some of us knew her as Rogers and the New Building, but still the object of our devotion. Come again, Lobbie and Jim; our latchstring is always out. — FRANK HAYES'90, *Secretary*, 614 Woodland Avenue, Duluth, Minn.

Technology Club of Hartford

The annual meeting of the Club in conjunction with the New Haven-Waterbury Club was held this year as usual on the last Saturday in June, and concluded the season for the Technology Club of Hartford. This outing was held at Westbrook, Conn., and despite light showers, the crowd assembled early and plentifully to play golf or tennis, or to loll on the beach. There was an intermission in the middle of the afternoon when everyone gathered at Sam Rogers' back porch for milk and doughnuts. The athletics were concluded by the great annual "Baseball classic" which established for another year the unquestioned supremacy of Hartford over New Haven-Waterbury by a score of 12 to 8, in spite of the fact that the losers had the advantage of three Hartford ringers on their team.

Dinner was served at the Casino and a short business meeting, interspersed with a lot of song, was held for the purpose of saddling the new officers with their duties. These officers are: President, Robert M. Keeney'09, Connecticut Light and Power Company; Vice-President, George I. Emerson'09, The Travelers Insurance Company; Secretary-Treasurer, Thomas D. Green'26, Wolverine H. and V. Equipment Company. — THOMAS D. GREEN, *Secretary*, 40 Westfield Road, West Hartford, Conn.

Montana Society of the M. I. T.

Taking the trail explored over a century ago by Lewis and Clark, Dean Lobdell and J. Rhyne Killian, Jr., also got lost coming into Butte from Yellowstone Park and landed pretty nearly in Helena before discovering they were a long ways from the dinner scheduled for them by the Montana Society of the M. I. T.

They both agreed, however, that the song "The Longest Way Round is the Shortest Way Home" had virtues, as the Boulder Hill route from Helena to Butte is of such scenic beauty that it was well worth the trip. In spite of all, they arrived here a day ahead of schedule, registering at the New Finlen Hotel on the night of July 6, making good the slogan "Tech men are always on time."

They spent the morning of the 7th visiting some of the "boys" and in the afternoon were escorted through some of the underground and surface workings of the Anaconda Copper Mining Company by Frederick C. Jaccard'07, mechanical superintendent of the company. They saw the giant pumps which lift copper impregnated water to the surface, from which is recovered over 9,000,000 pounds of copper per year, no matter whether times are prosperous or depressive. They also noted the ventilating system, which precludes the hot air from the deep underground workings and the huge electric hoists good for a vertical depth of 5,000 feet.

With the appetite attained, they met the former M. I. T. men of this vicinity at the Butte Grill, getting a first-page story in the next morning's paper, of which the first paragraph read: "Unlucky as to the number present, but lucky in the personnel of its Boston guests, 13 members and guests of the Montana Alumni society of the Massachusetts Institute of Technology attended the dinner and

meeting tendered to Dean Harold E. Lobdell and J. Rhyne Killian, Jr., officials of the Boston Tech, and so on."

At the dinner they learned that, reports notwithstanding to the contrary, Montana "chickens" are not tough. We learned all about the latest doings at Technology. They told us about the student registration, dormitories, and the $5,000,000 student loan fund. All regretted that there was not also a former-students loan fund. After the Dean finished his story, Mr. Killian gave us an outline of the reorganization of the Alumni Association, which brought forth much discussion, being joined in by our guests, Dr. Francis A. Thomson, President of the Montana School of Mines, Samuel Barker, Jr., father of Stewart Barker '27, and James G. Graham, father of Tom Graham '35.

On the morning of the 8th, Dr. Thomson and Mr. Barker accompanied our guests to the Montana School of Mines, one of the youngest but most aggressive institutions of its kind in America and which was highly complimented by Dr. Tryon on his recent visit. From the School of Mines they journeyed to the Washoe Smelter of the Anaconda Company, at Anaconda, and inspected the largest copper smelter in the world. That night, if they did not go on another exploration trip, they landed in Missoula, where we billed them to Dr. Chas. H. Clapp, with a sight draft of welcome attached. Dr. Clapp '05 is President of the University of Montana and we understand that he paid the sight draft in good shape and the travelers saw all there was to be seen in Missoula, including the co-educational department of the University. (Boston papers please do *not* copy.) After visiting Missoula, Lobdell and Killian journeyed on to Spokane.

Those who took part in the Butte welcome were: William L. Creden '90, Vice-Chairman of the Montana Society, who presided at the dinner; William A. Kemper '04; Frederick C. Gilbert '98; Walter R. C. Russert '18; James J. Byrne '31; Dr. George W. Craven '98; Frederick C. Jaccard '07, and the undersigned. — CARL J. TRAUERMAN '07, *Secretary*, 25 East Broadway, Butte, Mont.

M. I. T. Club of Northern California

Several meetings of our organization have been held since the last issue of The Review. On Tuesday, June 7, we had a special luncheon at the Engineers Club at which Captain J. J. Thomas '07, gave us an interesting astronomical talk preparatory to our visit to Lick Observatory on Mt. Hamilton the following Friday evening. This latter event was one of the most enjoyable occasions ever. Some 55 members with their families or friends gathered for a picnic supper on top of the mountain, 4,200 feet elevation, after which the main observatory with its two telescopes was practically at our disposal. The weather was ideal, warm and very clear, and the crowd was most congenial. We had the opportunity of viewing part of the equipment which was then being assembled to be shipped East for photographing the total eclipse of the sun the latter part of August and having it explained to us. Then we viewed Venus, a beautiful crescent in the west, through the ten-inch refractor, inspected one of the craters of the moon through the large 36-inch reflecting telescope, and later went back to the ten-inch telescope for a glimpse of Jupiter and its moons.

One Tuesday, June 14, at our luncheon at the Engineers Club, we were fortunate in having as our guest speaker, Mr. F. J. McConnel, Stanford graduate and for five years Lieutenant in the British Royal Naval Air Forces with honorary rank of Captain, during which period he spent 500 hours in the air in command of various types of non-rigid dirigibles on submarine observation patrol. He spoke to us on the *Akron*, not so much with reference to its constructional details with which most of us were somewhat familiar due to the publicity in the press, but more with relation to the operating difficulties and means of overcoming them. One of the most interesting items mentioned was the so-called temperature inversion which is usual in the atmosphere of this part of the country and which briefly means a continually increasing temperature of the air as elevation is attained up to approximately 4,000 feet from which point the temperature begins to fall again, whereas normally in other locations the temperature would fall continuously from the ground up. Incidentally, the fact that the maximum temperature point corresponds with the elevation of 4,000 feet explained why our picnic conditions on Mt. Hamilton were so ideal even late in the evening.

On July 21, a dinner was held in honor of Dean H. E. Lobdell and J. Rhyne Killian, Editor of The Review. In spite of the vacation season, a fairly representative crowd turned out, evidencing their interest in recent Technology affairs not only by close attention to the guests, but by questions and discussion lasting well toward midnight.

Regular Tuesday luncheons are held at the Engineers Club, Pine and Sansome Streets, San Francisco, to which all alumni are invited. A special table is reserved, and a very excellent lunch may be had for either 50 or 75 cents and no tips. — ROLFE A. FOLSOM '18, *Secretary*, 150 Hooper Street, San Francisco, Calif.

Technology Club of Puget Sound

The Puget Sound group was mighty pleased to see Dr. Compton on July 6 and hear from him many interesting things about Technology. James W. Pratt, President of the local club, and Neal Tourtellotte, Honorary Secretary, entertained Dr. Compton during his brief stay. On July 6 a small group, 13 plus Dr. Compton, had lunch at the Arctic Club. Dr. Compton's genial smile, his broad fund of information, and his willingness to present facts frankly made his informal talk very interesting and illuminating.

Just a week after the President's visit, the group met again for an evening meeting with Dean Lobdell and Jim Killian. Again 14 sat down to dinner at the Arctic Club, reminisced and heard some entertaining stories of Technology and of The Technology Review. Ye editor was chaffed because he let J. J. Rowlands slip through an item saying that Corvallis was in Washington, but we are hoping his geographic knowledge will be widened as a result of his tour to the Coast. Harold Lobdell acted wise, as a seasoned visitor to the Northwest should do, and refrained from enthusing too much about our scenery and weather. Maybe he was saving up for Los Angeles. Anyway, we had a dandy meeting and enjoyed having the "boys" with us. Most of their heavy thunder had been taken away by Dr. Compton, but that made their informal talks just that more interesting.

We certainly are appreciative of these visitors and we hope we can have more. They are the most important links we now have with the "Fatherland" or Alma Mater, choose your sex. — JOSEPH DANIELS '05, *Secretary*, University of Washington, Seattle, Wash.

Technology Club of Shanghai

The minutes of the April meeting of the Club follow: The meeting was preceded as usual by a dinner banquet held at the Great Eastern Hotel at 7:30 P.M. Thirty-four members were present and arranged in three tables, the officers of this year acting as hosts. — The meeting was called to order by President Ki Chen, after dinner, at 9:30 P.M. The minutes of the previous meeting were read and accepted by vote without correction. T. F. Wei, Assistant Secretary-Treasurer of 1931, read the financial report of the preceding year and T. K. Kao was appointed as auditor for the account.

The embroidered portrait of President Walker was shown at the banquet hall and the piece of art was highly praised by everyone present. Motion was then unanimously made that the Secretary should write a letter of appreciation to Mrs. T. K. Kao to thank her for her valuable assistance in getting the portrait made. The question of disposing of the remainder of the Gift Fund was then discussed. Mr. Arthur Sun, who was one of the original members of the Gift Committee, was asked to report. It was suggested by Mr. Sun to write to P. Y. Tang for a decision as Mr. Tang was the Chairman of the original committee.

Chairman Ki Chen then introduced the new officers for 1932: P. S. Hopkins, President; L. C. King, Secretary-Treasurer; Walter Kwok, Assistant Secretary-Treasurer. They were in turn called upon to address the audience. A vote of thanks to the retiring officers was cheerfully given by all the members present for their efficient administration of our club activities for the year 1931. — The meeting was adjourned at 9:45 P.M.

The May meeting of the Club was held at the American Club, 23 Foochow Road, on Friday evening, May 20, at 7:30 P.M.,

with President Hopkins acting as host. Thirty-five members were present. — Dinner was served at 8:15 P.M. While the dinner was in progress, William A. Adams '08, one of the eldest members of our Club, introduced some very humorous and interesting topics for conversation, particularly the course in Precision Measurement which aroused considerable enthusiasm at the dinner table, recalling the good old days spent at the Institute. The name of Professor Drisko and other Faculty members in the Department of Physics was mentioned from time to time.

The meeting was called to order by the President at 9:15 P.M. Minutes for the previous meeting were read and accepted. Mr. Adams suggested that the Secretary should write a report of every meeting of our Club and send it to The Technology Review so that the Shanghai Club will be properly represented in the Alumni News columns. May we add that news of Technology in China will be welcome.

C. R. Webb, Assistant Chief Electrical Engineer of the Shanghai Power Company, gave an excellent talk on the general trend of development of power plant engineering both in Europe and America. Mr. Webb's talk covered topics from generation to transmission and distribution of electric power systems, and was highly interesting and instructive to everyone. — At the close of the meeting W. A. Adams '08, T. K. Tse'08, and C. H. Lynott'15 were appointed hosts for the next meeting. — The meeting was adjourned at 10:15 P.M. — L. C. KING '26, *Secretary*, P. O. Box 434, Shanghai, China.

The M. I. T. Club of Western Pennsylvania

The members of the Club remember with pleasure their summer outing which was to be held on the evening of Friday, August 26, 1932. Mark Greer'26 generously volunteered the use of his home at Rosslyn Farms for the occasion. It is rumored that those who enjoy the proper accompaniment of the Stein Song were not disappointed.

Several members journeyed to Akron on Sunday, August 21, to attend the tea given by the Akron Club in honor of Dr. Compton. After the tea, the party made an inspection of the Zeppelin U. S. S. *Macon*.

The ranks of the bachelors have had another desertion. On June 20, Miss Claire Erny of Pittsburgh was married to George Ousler'16, past President of our Club, and one of its active members.

The weekly luncheons of the Club are still held every Friday in McCreery's Dining Room, Sixth Avenue, and all M. I. T. men who happen to be in Pittsburgh are invited to attend. The monthly meetings will be resumed soon, and will be held at the University. — SAMUEL J. HELFMAN '24, *Secretary*, Philadelphia Co., 435 Sixth Avenue, Pittsburgh, Pa. CHARLES M. BOARDMAN '25, *Assistant Secretary*, Duquesne Light Company, Pittsburgh, Pa.

NEWS FROM THE CLASSES

1877

The Fifty-Fifth Reunion of the Class of '77 was held at the Algonquin Club, 217 Commonwealth Avenue, Boston, Tuesday, June 14, 1932, at one P.M. Of the 40 living members, 12 responded to the request of President Clarke to be his guests. The following members were seated at the table as mentioned: President Clarke, Kittredge, Gray, Quimby, Plimpton, Beeching, Sherman, Mudge, Leach, Davis, Carter, Williston. This was the first time since his leaving the Institute that Leach had met with the class. Letters were read from Bacon and Dr. F. Tucker Hopkins. A folder giving the names of living class members and their addresses was distributed. The names of 91 deceased members were given, also the names of six members whose addresses are unknown. President Clarke was reëlected for the coming year, as was B. T. Williston, Secretary-Treasurer, who was also elected to represent the class on the Alumni Council of the Alumni Association.

A card from B. C. Mudge gave a change in address to Tudor Crest, 14 Chancery Court, Lynn, Mass. I have received letters from Dr. Frank T. Hopkins, 142 East 71st Street, New York City. He was much pleased to receive a visit from Kittredge and I am sure he would be pleased to see or hear from any member of the Class. Dr. Hopkins is the only living member of our class whose address was unknown as given by Dick Hale in his last list.

The following memoir, prepared by George T. Seabury '02 for the American Society of Civil Engineers, was sent me by A. L. Plimpton.

"William Henry Lawton, a son of William H. and Charlotte Amelia (Tilley) Lawton, was born in Newport, R. I., on April 14, 1853. After his primary education, he attended the Newport High School for a time. In 1872, he received his first training in engineering when at the age of 19 he entered the office of a local engineer, remaining there about a year.

"This work, although perhaps elementary in character, must have induced in him the desire for a real education, because he determined to continue his studies through high school and college. In 1873, the City of Newport constructed a fine new high school, the gift of Mr. William Sanford Rogers. The first class to be graduated from this new school was that of 1874, and Mr. Lawton, after his one year of further study, was of the eight then graduated. In September, 1874, he entered the Massachusetts Institute of Technology as a Sophomore and continued with his class at the Institute until May, 1876, completing the second and third years of the Civil Engineering Course.

"Newport was then and is now an important military and naval center. For a year Mr. Lawton was in the employ of the City of Newport; but in April, 1878, he was appointed to a position in the United States Engineer Department and sent to superintend the construction of the Block Island Breakwater. For three years he was engaged in this branch of the Government service, at Block Island, on the Providence River improvement, and on surveys, until in April, 1881, he was made Assistant United States Engineer by Gen. G. K. Warren, U. S. A., and placed in charge of the construction of jetties at the entrance to Nantucket Harbor, Mass. He continued there until February, 1884, after which, until the time of his death, he practiced civil engineering in Newport, specializing in sanitary engineering and in road work.

"During this interval Mr. Lawton twice held a public engineering office; from 1885 to 1889 as Street Commissioner for the City of Newport, and from 1903 to 1914 as its City Engineer. He retired from active practice in 1922.

"It was in the interval between these official connections and during the writer's first summer vacation of his college course that, wanting to do some practical work, he appealed to Mr. Lawton, who promised some day to give him a job. The promise was kept and one afternoon soon afterward his chance came to hold the zero end of the tape on a small survey. He demurred, but Mr. Lawton insisted, saying the rate of pay for that position was $1.00 per day; the money was his and he must take it. Mr. Lawton was just as scrupulously punctilious in all business transactions to the day of his death.

"Newport at the time of Mr. Lawton's greatest activity in private practice was developing as a 'summer colony' for 'the Four Hundred,' and their magnificent estates on the rockbound New England Coast presented many private sewage disposal problems, the solution of which fell to Mr. Lawton. Access roads and grading, too, called for his advice, design, and supervision.

"He loved his work for its own sake and for the sake of those with whom it brought him in contact. Sometimes it was only a farm to be surveyed, but the work was studied as meticulously as if it were in the heart of the metropolis.

1877 Continued

"He had a sense of humor that was delicious. On one farm survey it was reported to him that a boundary was of a certain length. He told his assistants that they must have made a mistake because the records of an earlier survey, made by a lame man, showed it to be 100 ft. shorter. His party remeasured the line, reporting their figure as correct and those of the earlier survey as incorrect. Mr. Lawton sighed and said, 'Well, maybe he paced it and lost that hundred feet with his short leg.' However, he checked it again himself to be sure.

"Mr. Lawton joined the Society when the total membership was only about 1,025. His Society number, 972, and his name were engraved on the back of an old-style Society badge which he wore as a necktie pin. On February 1, 1931, he suffered a paralytic stroke from which he never wholly recovered, dying on November 4, 1931, at the age of 78; but in that interval he sent the pin to the writer with the request that he wear it as his own after he had had the new name and number engraved on it. It has been an honor to write this memoir at Mr. Lawton's own request — to tell, with enthusiasm, of a generous, kindly, humor-loving man and withal a most scrupulous and capable engineer.

"Mr. Lawton was married on December 4, 1889, to Mary J. Becar, who, with a son, Charles S. Lawton, a daughter, Mrs. Evelyn Hubbard, and a sister, Mrs. B. B. H. Sherman, survives him. He was a member of the Protestant Episcopal Church, and Secretary of the Seamen's Church Institute.

"Mr. Lawton was elected a Member of the American Society of Civil Engineers on June 2, 1886." — BELVIN T. WILLISTON, *Secretary*, 3 Monmouth Street, Somerville, Mass.

1882

The long-expected Fiftieth Reunion of '82 began modestly on Monday, June 6, when a single member joined with guests of 1932 in attendance at Class Day exercises in Walker Memorial, a much enjoyed occasion.

At 10:30 the next day the Class began to assemble on the second floor of Symphony Hall where the Faculty and Corporation were robing themselves for the Commencement procession. With the help of Dr. Prescott the Class speedily assumed an academic air hitherto unknown to it — caps, gowns, and hoods worn for the first time by the majority, making them appear very dignified and learned. They took their places in the procession behind the Corporation and were soon seated on the platform in full view of an admiring audience, at least we assume that said audience was properly impressed. Some at least, we afterward learned, were rather puzzled by the presence of the Assistant Secretary who really did not look as if she graduated in '82. Those who braved the terrors of the Academic Procession and the stares of a huge audience were: Miss Ames, Cheney, Darrow, Faunce, French, Gooding, Jenkins, Ross, Walker, and the Assistant Secretary. The Commencement program was undoubtedly of great interest but the exalted position of the Class behind the speakers did not permit them to hear too clearly. One member confided to the Assistant Secretary at the end of one and one-half hours that the one longing of his life at the moment was the luncheon.

The President's luncheon in the beautiful dining room of his house on Charles River Road, with Mrs. Compton as the gracious hostess, was a delight from every point of view. The guests, other than the members of '82, included Sir Henry and Lady Thornton (Sir Henry being the Commencement speaker), Dr. and Mrs. S. C. Prescott, Dr. and Mrs. H. M. Goodwin, Dr. and Mrs. Bush, Professor and Mrs. Jack, Mr. and Mrs. Godfrey Cabot, Mr. and Mrs. Walter Humphreys, and Mr. Parris, the President's Secretary.

After the downpour that began during the Commencement exercises, it cleared beautifully in time for the President's reception at Walker Memorial, and a few of the members of the Class attended.

Noon the next day found the same group with some additions gathered for luncheon at Baldpate Inn, Georgetown. It was a clear day but rather cool so that the fire in the big fireplace in the living room was very welcome. Dr. and Mrs. French, with Miss Ames, were the first arrivals. Then came the Assistant Secretary bringing the Secretary and his son, Leland. Cheney, Faunce, Gooding, Arthur and Mrs. Walker, Charlie and Mrs. Jenkins, John Low and his son Bunny, and Harry Ross completed the party which sat down to luncheon, but Dean Jenkins arrived before it was over. After the inner man was satisfied with chicken, asparagus, and other good things, the Secretary called on various members to account for themselves since last meeting. Letters were also read from Mrs. Clark, Rosing, Keyes, Chapman, Wardwell, Adams, Jones, Thompson, Lewis, and Johnson. All modestly disclaimed any great achievements in the past 50 years. Mrs. Clark reported herself in excellent health "for one of my years" but Rosing had to confess to being practically an invalid. Adams expressed his regret at being unable to attend as he "would like to see the remnants of our Class before I kick off for good." He reported Ayer as being in Cuba. Harry Jones wrote of speaking engagements in connection with the Centenary celebration of the writing of "America" by his grandfather, Rev. S. F. Smith.

Souvenirs sent by Louisa Hall were then distributed to members of the Class. They proved to be cuff buttons which her father, Frank Hall, had turned and polished years ago in a little shop in West Rindge, N. H. There was great variety in shape and material and showed careful workmanship.

Some of the members of the party had to hurry away but others lingered to stroll about or to climb Baldpate and see the glorious panorama of hill and valley and the distant glimpse of the ocean, leaving about five o'clock.

There could not be a more fitting ending to the account of the Fiftieth Reunion than the letter of greeting from Wardwell, containing as it does not only a backward but a forward look. "Dear Classmates: As this message is being read to you, the pages of memory are turning and I see again the many things so deeply engraved thereon. The smile, the quip, the pose, the glance, pertaining to yourselves and to those who have passed over into the Great Beyond, yet clear and dear after all these years. Absent in the flesh, I am yet with you in the mind, and hope that you, and those who may accompany you, will consider this as a mental hand clasp.

"I would love to learn of, and to rejoice with you at, some prized accomplishment; and perhaps to sympathize at the failure of some elusive attempt. I would love to note the air of serenity so indicative of acquired good things. I would love to learn upon what favorite fruits your minds have nourished, and what flowers your hands have plucked as you have threaded your ways through the gardens of Life. And what particularly attractive fruits, and glorious flowers, concealed at the point and time of passing, you have clearly and perhaps wistfully noted as you have looked backward in memory.

"Time has mellowed my philosophy. My sense of losses is overwhelmed by a certainty of the glorious things yet to come. In spite of the bruises and tumbles consequent upon scaling its heights and descending into its plains and valleys, my Life has grown more rich, more sweet, and lovelier with the passing of the years; and I am reluctant to believe that your dividends from living have been less many and generous.

"As parents sing in their hearts at the certainty that the coming morning will be radiant and musical with the laughter and songs of their dear ones, so am I certain that — so very soon — when I shall have joined those Classmates in the next stage of God's Continuum of Eternity, there will be a like rendering by those things I dream of accomplishing there, which I shall have left undone here. Receive this message not as a minor, but in a full, rich, resonant, major tone. Until next year (Ah! those next years!). Faithfully yours, Charles J. A. Wardwell."

It is particularly gratifying to Class members that this account of our Fiftieth Anniversary should be written by the daughter of the late Walter Snow, for many years our valued friend and Secretary. — ALFRED L. DARROW, *Secretary*, 39 Garrison Road, Brookline, Mass. RACHEL P. SNOW, *Assistant Secretary*, Box 51, Falmouth, Mass.

1884

None of us will forget the good time we had in 1920 steaming down to Plymouth in du Pont's *Tech*. A fire of unknown origin destroyed it in Baltimore on April 13; it had been presented to the Maryland Conservation Commission by Mrs. du Pont.

1884 Continued

Coburn was one of the first to feel the effects of the law passed in July discharging many Federal employees. He had, however, served two years beyond the age at which he was expected to retire. It will be remembered that he was assistant to Professor Norton and later in Freshman Chemistry. In October, 1886, he became examiner in drugs, medicines, and chemicals at the Port of Boston and Charlestown, finally becoming Chief Chemist of the Customs Laboratory. He has served the communities in which he lived as School Committee man, Library Trustee, and Parish Clerk. He also served on the Board of Civil Service Examiners for the Port of Boston and Charlestown.

Doane was also retired in May as Mechanical Engineer of the Metropolitan District Commission, Water Division; it will be recollected that he graduated in Mining and no doubt found this training valuable in looking after water pipe diggings; no course offered at that time could have fitted him better to deal with surveying and drawing, with engines, pumps, boilers and fuels, and chemically with the different waters, paints, and protective coatings. Doane was a member of a committee of the A. S. C. E. which made a praiseworthy report upon paints for standpipes.

Holder died July 22 at Lynn, of angina pectoris, in his 69th year. He graduated from the Massachusetts College of Pharmacy after graduating from Technology in the chemical course and, with an uncle, operated the well and favorably known Holder's Drug Store in Lynn, which had been in the family many years. An advantageous opportunity presenting, the business was sold and he devoted himself to private interests. He was very much interested in French and German, speaking both languages, and in mineralogy and nature study. His weekly visits to the Faculty Club will be missed by his friends. — Newell died July 5 and his biography will be found next month with the Class of '85, with which he graduated.

On June 6, T. W. Robinson attained the age of 70 and was retired on a pension in accordance with the rules of the U. S. Steel Corporation. He will remain with the company in an advisory capacity and have his offices in the same building as before. — Robinson graduated in the Mining course, and ere long became Chief Chemist for the Joliet Steel Company, which finally was merged in the Illinois Steel Company and this, in turn, in the U. S. Steel Corporation. After his experience with the Illinois Steel Company, he was seven years as General Superintendent of the Pueblo plant of the Colorado Fuel and Iron Company. He returned to the Illinois Company in 1899 as General Manager, becoming later First Vice-President, which position he held at retirement.

During the World War he served on a Committee to provide adequate housing facilities for munition and industrial workers. He has been especially interested in educational problems. He helped to reorganize Chicago's Board of Education, was the Illinois Chairman of the National Society for the Promotion of Industrial Education, and has served on the Corporations of Northeastern University and M. I. T. Besides this, he was largely responsible for settling very satisfactorily the troublesome matter of straightening the Chicago River. At the request of General Dawes, he served on the Commission to reorganize the finances of San Domingo.

Besides being on the Corporations named, he is a director in several banks, a trustee of the John Crerar Library, of the Rosenwald Museum, the Art Institute, the World's Fair, and a patron of the opera. He has lived up to what he wrote in his class history nearly 25 years ago: "A character well-rounded, acquaintance, ability to meet and read men are fundamental factors to success, and are essentials that cannot be derived from books alone. Technology is doing well to devote more time to social engineering than it formerly did."

He has one of the finest collections in the country of Egyptian and Roman glass. Besides being interested in steel in a business way all his life, he has been even more devoted to steel in private life, for in 1891 he married Miss Frances Steel. — AUGUSTUS H. GILL, *Secretary*, Room 4-053, M. I. T., Cambridge, Mass.

1888

On March 30 the "History of the Class of '88" was published and copies were mailed to all active members, 98 in number, as given on pages 97 and 98 of the "History" as well as to seven widows of classmates and four officials at the Institute for files and records. As stated in the foreword, "This publication, unlike its predecessors, contains no record of the achievements of each individual member of the Class, but rather the Record of the Class as a whole during its entire 48 years of existence, including undergraduate activities and athletic accomplishments, anniversary reunions, and celebrations, with reproductions of photographs taken at various times since the fall of 1884, when we entered the Institute as freshmen, down to our Fortieth Anniversary celebration only a few years ago." The "History" contains 65 illustrations and 100 pages. If any classmate did not receive a copy and wishes one, will he kindly communicate with the Secretary?

The fourth annual "Ned Webster '88 Class Dinner" was held on June 11 at Webster's summer home in Chestnut Hill, Newton. This was the most delightful of them all. Twenty-five classmates were present, or within one of the maximum, which occurred in 1930. Those who enjoyed Webster's abounding hospitality and took part in the grand parade around the wonderful gardens were: Bates, Blodgett, Blood, Bridges, Cheney, Cole, Collins, Conner, Eastman, Ellis, Faunce, Flint, Hamblet, Horn, Keough, Mead, Reynolds, Roberts, Runkle, Sawyer, Sjostrom, E. M. Smith, Webster, Williams, and Wood. Letters of regret were received from Besler, Sweetland, Dearborn, Buttolph, Faxon, Thompson, Quigley, Holman, Foque, and Perkins.

Kind words of appreciation of the "History" have been received from Holman, Buttolph, Quigley, Ajuria from Cuba, Joseph Cooke Smith from Switzerland, Besler, Mrs. William G. Snow, and Mrs. Richard Devens as well as Col. Frank L. Locke, Personnel Director, Professor C. E. Locke, Alumni Secretary, Mr. J. Rhyne Killian, Editor of The Review, and last but not least, Teddy Foque from far-off Minneapolis, who has not been in Boston since we graduated (to attend a Class Reunion) but renews his resolution to attend the biggest of all, our Fiftieth.

At the class dinner it was voted that a committee be appointed to investigate and select the most suitable place for our grand Fiftieth Anniversary of Graduation, to be held in June, 1933, at a point not far from Boston. President Sawyer will appoint this committee early in the fall.

The Secretary finds that he neglected to report that Lt.-Col. Thompson and Major Horn opened the Commonwealth Country Club course to 1932 play on the first day of the year and have played golf together every month of winter, spring, and summer up to date. May "birdies" sing for them frequently.

Mrs. Guy Currier of Peterboro, N. H., has recently opened to the public the 18-hole golf course started by her husband as a private course. President Alfred visited Secretary B. R. T. at Chebeague Island, Maine, in July and is now enjoying a stay at Block Island, R. I. — B. R. T. COLLINS, *Secretary*, 18 Athelstane Road, Newton Center, Mass.

1890

A recent issue of The Review reported that S. Douglas Flood's name had been sent to us as a Consul at Ottawa, Canada, but we did not know whether it was Doug himself, or his son. We had a letter back from Doug, saying it was his son; but on the morning of June 13 a telephone call came from Doug in Boston, and he came out and spent the day with your Secretary, and left us that night for New York on his way to Chicago.

We are advised that Pierre S. du Pont attended the Republican Convention in Chicago in June. On February 17 the Centenary Medal of the Pennsylvania Horticultural Society was presented to Mr. and Mrs. Pierre S. du Pont of Wilmington, Del., for their efforts in the creation of Longwood, with its magnificent greenhouses and landscape development, including as they do such a large and rare collection of plant life, and renowned not only in this country, but abroad. The medal has only been awarded two times before: first, to Mr. James Boyd, who gave the latter years of his life to the work of the Society and the compilation of its history; second, to the Massachusetts Horticultural Society, when it celebrated its 100th anniversary. Mr. du Pont acknowledged the award in the following words: "We have not

1890 Continued

found the work a great effort. It has given us a great deal of pleasure, and I wish to assure you that the Gate will always be open at stated periods to the public and you will always be welcome to enjoy it." Your Secretary and Mrs. Gilmore visited it last year and it was well worth the trip.

A card from Darragh de Lancey advises that in April he left on a 2,500-mile motor trip through the South with Mrs. de Lancey. — George E. Hale was in London in May and attended a meeting of the International Research Council, of which he was made Honorary President. He arrived back in New York, June 3. He had hoped to be in Boston for a day or two, but unfortunately found it was not possible as it was necessary for him to get back home to Pasadena.

We have been advised recently that Francis Folger Hussey died May 17, 1924, at the Newton Hospital. Hussey was only with us our freshman year, and this is the only word we have ever had of him. — Mrs. Louis J. Paris of Burlington, Vt., passed away October 1, 1922.

On June 14, Professor William Z. Ripley of Harvard University appeared before the Senate Banking Committee and advocated full publicity in operation of corporations — that it should be open to the public and include the number of shares owned by each officer. — In the press under date of June 20 to 23, articles appeared from the pen of Professor Ripley on railway questions. We also note that on June 18, Billy left for Bermuda, where he is attending the American Institute of Interior Decorators, which is to be held aboard the Steamship *Monarch of Bermuda*. We were not aware before that Billy was especially interested in decorations, until we read this, and we presume one reason he has gone to Bermuda is to escape from the editorials that may appear in the press as a result of his articles on railway questions. We trust, however, he will get in a few rounds of golf, and be in shape to tackle your Secretary on his return. Another interesting article from the pen of William Z. Ripley appeared in the August issue of the *Forum* on Public Utility Insecurities.

The Board of Water & Power Commission of Los Angeles has re-employed Burdette Moody as business agent. The position was returned to Moody at five hundred dollars per month.

The H. M. Goodwins and son spent a few weeks this summer at Valley Ranch, New Mexico, where they enjoyed horseback riding and picnics. They planned to return in time to witness the eclipse. — Dr. Willis R. Whitney, who was under the weather in June, is much better and feels more like himself again. — GEORGE L. GILMORE, *Secretary*, 57 Hancock Street, Lexington, Mass.

1891

William Cumston Richardson passed on at Santa Cruz, Calif. on July 25, 1932. We have had no direct word from him for some time as his health has been failing for a number of years. He was always interested in Class news and any request for funds met with a most generous response. We know nothing of his recent life and have tried to get more information from his brother and also wrote George Hooper. George talked with William's brother who says that Billy had steadily failed since the first of the year. George further writes of his recollection of Billy during Tech days: "I knew Billy quite well during our years in Tech as his relatives, the Cumstons, were long-time friends of my parents. He was a genial chap, friendly and full of quiet humor. He was generally interested in athletics without trying for any prominence in them and played often on the scrub football teams, also played halfback on the Course II team in the Class League. I remember his playing in the game which that team played against the then Harvard Sophomores, Ned Cunningham being the other half — this must have been the '91 Class Team. Billy also played in the game which the '91 Mechanicals played against the '91 Electricals, Harry Young being the other half-back. Billy and Hamilton Rice were close friends and spent much time together. I lost track of Billy after leaving Tech and did not again cross his trail until I settled here."

Howard Forbes' son, Howard, was married on July 9 to Celeste S. Terry. The ceremony was at Fish Creek, Wisc. They will live at Huntington, L. I. — A nice letter from John Putnam in which he tells of a visit to Thornton Burgess at Hampden, Mass. His daughter's jam kitchen in West Haven, Conn., is still active, but business has fallen off. If you want the real stuff in this line, jams, jellies, preserves, and so on, drop a line to the Putnam Kitchen, 214 Elm Street, West Haven, Conn. Several of us have sampled the goods and we know.

Gorham Dana has spent most of the summer at his new home, "Ematuyus" (Indian for "almost a house") at Lake Sunapee, N. H. Gorham says that he tried to duplicate Walter Douglass' dinner of last year but Charlie Aiken was away. Walter and his daughter and Frank Howard and his daughter-in-law came. Between his garden, house, lawn, and wood lot, Gorham is renewing his youth. He sends in an account of an unusual occasion in which Walter Douglass played an important part. "A most unusual event took place August 21 on the slopes of Mt. Kearsarge, N. H., 1,900 feet above the sea. There on a plateau with a magnificent view to the west of hill and valley, lake and stream, in the bright sun of a perfect summer day, a thousand people were seated in the grass in a natural amphitheatre at a vesper service, the high point of which was the gift of about 65 acres of land to the state by Walter Douglass. There was singing by a quartette, addresses by several ministers of the Kearsarge Ministers' Association, address by the forester of the Society for Preservation of New Hampshire Forests, the ceremony of giving the land, and an address by ex-Governor Tobey. Walter made a fine address in presenting the tract to the state and it was received by State Forester Foster. Walter was praised by the speakers for this unique gift which was in memory of his aunt who at one time lived there. The property is at the end of the carriage road and the beginning of the most popular trail up the mountain which is the highest in the vicinity and has an elevation of 2,937 feet. Dana and Howard were amongst the thousand spectators."

Albert Gottlieb writes Barney from New York City, and others of our friends and classmates will pretty much agree, that "the profession of architecture seems to have been practically annihilated." Things already look a little brighter and new and better buildings will again come to the front. He tells of locating Fred Hendrick Briggs who is an architect and lives at Plandome, L. I.

Harry Young wrote Barney of a Birthday Party for Steve Bowen on board the *Paris*, en route for France, with birthday cake, champagne, and all the fixings. — Mrs. James Swan passed away on June 14 after several months' illness. Jim's son was killed recently and this leaves only Jim and his daughter Katherine to "carry on."

Charlie Garrison writes of his auto trip to the Pacific Coast, leaving Cambridge about June 20. "We are prompt starters and were two minutes ahead of time (7:58 instead of 8:00). We had a good day's run, Cedar Rapids — Columbus, 5:47 A.M.–2:20, 337 miles, crossing the Missouri River. Saturday, June 25, Columbus to Julesburg, 5:51 to 1:57, 294 miles, altitude and temperature rising (70°–89°). Sunday, Julesburg to Parco, 5:42 to 2:25, 319 miles, crossing the Rockies 8,835 feet on high. Had first puncture soon after leaving but changed tires in 12 minutes! Fine day (65°–80°). It was a close night at Parco and, like all the places except Cherry Valley, St. George, and Barstow, freight trains were howling a good part of the night. The hardest part of crossing is the few hours of real sleep that one gets. Monday, June 27, Parco to Salt Lake City, 5:45–2:53, 309 miles (51°–91°). Some poor roads. The second puncture, 14 minutes to change this time. Then dropping 2,700 feet into Salt Lake City, one of the hottest places anywhere.

"Now we start on Route 91, hot as the hinges. Salt Lake City to St. George, 6:09–2:50 (311 miles) a good bit of the way at 100°. Wednesday, through the desert, was the day I feared most. Got to Las Vegas on the edge of the desert with 100° temperature. On the steep grades the engine boiled and we had to stop for a bit — once over we went down grade for over 20 miles, but the temperature was now 111° and for 60 miles we had to go at a snail's pace and stop now and then to give the beast a drink of water. For the first time I carried a water bag holding three or four gallons, which came in very handy. The car was very heavily loaded. I should say we had 800 pounds of dead weight. We finally came into Barstow after the toughest day's run (5:28–3:11), 285 miles. The Beacon Inn (air cooled) is one of the nicest hostelries in this country and we could rest well as our journey's

1891 Continued

end was in sight. As we were at dinner we saw a car pass and sure enough, Bob and Robbie appeared to escort us the balance of the way. Next morning we had our last climb over the Cajon Pass and coasted down to San Bernardino. The weather was perfect, temperature 80°. The engine ran cool. The oil which had thinned out the last three days so that the pressure was very low, now rose to normal — and all was hunk again. We reached the new house at 11:30 — where we have been very busy ever since unpacking. It is a very charming spot, the house most satisfactory in every way. I took my first swim in the surf last evening."

Another letter from Charlie followed in about a month, written from Long Beach, Calif., where he is now living with his son. "Tomorrow we leave here at 8 A.M. with the children to go to the market in the center of the town (three miles from here). There are about 100 booths set up around Pacific Park near the City Hall by nearby ranchers. We buy enough to last us a week. Peas, 6 lbs. for 25c; beans (string) 2 lbs., 5c; Crawford peaches, 6 lbs., 10c; 4 lbs. tomatoes, 10c; cantaloupe, 4" to 5" diameter, 2 to 3c each; potatoes very cheap, eggs and milk more like eastern prices. For oranges we now go to the packing houses. I got a bushel (243 oranges) for 50c. These will make about 12 qts. of juice. I just made 2 qts. after supper in the fine orange press that Bob gave me for a birthday present."

We have notice of change of address of Charlie Clark to Ledge Road, Gloucester, Mass. — George Hooper is one of our regular correspondents and the following is taken from his first letter to Barney after his trip East. "We are to have our daughter, son-in-law, and granddaughter with us for about a month, so shall not lack for company. Our son's research work at California Institute of Technology will keep him busy all summer and is carried on under most comfortable climatic conditions, he having the use of a special underground cellar designed to eliminate vibration and temperature changes. He, therefore, spends most of his daytimes in a quiet temperature of about 58°–60° F. When next you phone your Aunt Carrie please give her my cordial good wishes. Her interest and care made my Dedham visit most comfortable and happy and the recollections brought up in our discussions of 'old times' awoke many pleasant memories. The Review with Henry Fiske's account of the '91 dinner came yesterday so that it, with your letter, have revived pleasant appreciations of the event and the 'crowd.'"

Morris Knowles made Barney a very pleasant and a very much appreciated visit recently, coming by train from Boston especially to see him. Morris made a wonderful recovery and he conserves his strength and is able to carry on his engineering organization. Another '91 picnic with Barney at Cohasset on June 4 was arranged especially for Charlie Garrison on account of his departure for Long Beach, Calif. Gorham Dana, Howard Forbes, and Arthur Hatch made up the '91 Reunion of five. Charlie brought thermos bottles of his own brew of '91 fruit punch. Write him for his formula which he will send free to any member of the Class upon request. Charlie showed his cards and method of keeping his very comprehensive log of his proposed sixth crossing of the continent. The picnic chanced to be two days after Barney's birthday.

One of the ladies of '91, Dr. Anna M. Gove of Greensboro, N. C., came to see Barney, Sunday P.M., July 17. She was visiting friends in Marshfield and was to leave the next day for Sargentville, Maine, to stay until September. — Charlie and Mrs. Wetherbee visited Barney on the afternoon of July 1, leaving about 2:30 to drive to their home, Bath, Maine.

Another '91 picnic was held on Ferry Hill when Harry and Mrs. H. I. Cole with their granddaughter came for Mrs. Capen and Barney and took them to Third Cliff and Humarock. George, Mrs. Holmes, their daughter, and Mrs. Holmes' aunt, came to see Barney one evening recently.

Charlie Hanington is another of our regular correspondents and the following is from a recent letter: "I received the 40th Year Book and was much interested in looking over the names. I have not seen Kauffman for years. We travel entirely different paths, never even see him in a business way. A week ago I drove out into northeastern Colorado where we are digging bones. Very interesting rhinos, some millions of years old. We also have three truck loads of the small camel which we dug up in western Nebraska. They roamed the plains millions of years ago and are the ancestor of the modern camel. We are looking forward to a treat tomorrow when Henry Farfield Osborn and Granger of the American Museum of Natural History, New York City, will be with us for two days. Osborn is to make measurements and study the huge mammoth we dug up last summer and have mounted in our fossil hall. It is the largest one in the country and Osborn says a new specie." — HENRY A. FISKE, *Secretary*, Grinnell Company, 260 West Exchange Street, Providence, R. I. BARNARD CAPEN, *Assistant Secretary*, The Early Convalescent Home, Cohasset, Mass.

1892

The Fortieth Reunion of the Class was held at Boxwood Manor, Old Lyme, Conn., from June 3 to 5, and is now past history. The following account will let those who could not be with us know what they missed. Those who did not miss it were: Carlson, Dean, Fuller, J. W. Hall, Heywood, Locke, Maynard, Nutter, Ober, Pettee, Sargent, Shepherd, Hutchinson, Burrage, Kales, Parrish, Stone, McCaw, Moody, Congdon, Fairfield, Tidd, and Harwood. Most of us got to Old Lyme on Friday afternoon and after dinner assembled around a fireplace and listened to general talk by everybody. An interesting account of conditions at the Institute from the viewpoint of the Faculty was given by the Faculty members, Professors Fuller and Hutchinson, which was preceded by the reading of messages from some of our absent class members, which will follow anon.

Saturday was given up to golf by some; Locke had a bowling party; and then there were rides about the country and talk, and then more talk. Stone's contribution to Saturday evening's dinner was much appreciated. After dinner the annual meeting was held and the former officers were reëlected. To refresh your memories on this point, they are: President Kales, Vice-President Hutchinson, Secretary-Treasurer J. W. Hall. The Treasurer reported that the fund raised some years ago for the Secretary's expenses is intact, only the interest having been expended. This seemed to give satisfaction. It was voted that the felicitations of the Class be sent by the Secretary to President Compton and Professor Vogel. Here let me say that before this had been done Professor Vogel had passed away, as was announced in the July Review.

We then had a talk by Harry Carlson from the viewpoint of the Corporation, which showed us how much progress has been made in many ways since we were students. After this, Parrish asked if he might have something to say, and I regret that this something could not have been taken down and recorded so that all could read it here. Very briefly and inadequately I will try to give you an idea of it. It was his belief that one of the main reasons for present conditions was that we have strayed away from the old ideas. The first public buildings erected in the New England towns were the schoolhouse and the church, showing how our ancestors regarded education and religion. The first, education, is still emphasized, but the church is being neglected, and in the education of youth, the importance of the formation of character through religious influences should be emphasized if we are to continue to hold our place in the world. At the conclusion of his talk the spontaneous applause which followed showed how he had carried his hearers with him and the evident agreement of all. He was followed in much the same vein by Kales and Burrage.

The evenings, of course, had a lighter side, to which Burrage contributed by singing a song to which all joined in the chorus, and at a suitable hour all retired to think it over. After lunch Sunday the party broke up, all agreeing that it had been one of the best reunions we have ever had. And here it should be said that the success of the party was the result of the good work of Hutchinson who made the arrangements.

Here are the messages read at the gathering Friday evening. From Professor Charles Chase: "Sorry that I cannot take advantage of the trip to Old Lyme. It is in the midst of things at Tufts." From Albert Church: "Give the boys my very best regards and express to them my regret at not being able to be with them. I am still in harness and in good health." From Sumner Ely: "I should enjoy meeting the men immensely and also being in

1892 Continued

Old Lyme as my ancestors 'hail' from there." Gayle Forbush, after regrets, says: "I am leaving for California the last week in May and can't make it. Please give my felicitations and best wishes to those who are present." George Goodell said it had been his intention to come with his wife and daughter but business prevented. William Gray writes: "Mr. W. Spencer Hutchinson and my old college mates of '88–'92, greetings. It is with great pleasure that I remember you all, Class of '92 (Here he inserts the Yell), Officers in '92, President William Robert Kales, Vice-President William Willcox Green, Secretary Severance Burrage, Treasurer Frederick Leland Rhodes. And I remember that the ties of friendship that bind together the hearts of fellow students are ties that strengthen from year to year until they become bonds no human force may sever; that the memories that grow up within during the few short years of our college course are the sweetest memories that in the future sorrows and joys of life have risen before me obedient to my retrospective Will."

Mrs. Mary Lovering Hohman writes: "The 'stag' rather drops me out but I hope you all have a wonderful time. My daughter and I have just returned from a month's drive through some of our country, 3,600 miles. The U. S. A. is a vast place." George Ingraham regrets and sends kind regards "to all the boys that are no longer boys." If he had been with us he would have said that some were still boys in spite of the years. Professor Albert Mathews sent his remembrances from the University of Cincinnati, which did not arrange its closing to suit our reunion. Lawrence Manley sent word that the health of Mrs. Manley was such that he couldn't leave home, and since then I have received from George Rowell a clipping from the Philadelphia *Ledger*, without date, with an obituary account of Mrs. Manley.

Walter Newkirk hoped that we all would have a good time. Arthur G. Pierce says: "No. I won't get to Old Lyme, though I like the name. Forty years ago they taught me to 'grind' and I am still at it, especially these times. I hate to miss the party. I will be with you in spirit and good wishes to all. Tell any competitor that I have four fine grand children." William Rosewater says: "It's a long way from the Pacific to the Atlantic and I have not escaped the depression." This was from Los Angeles. — George Rowell writes: "I find that it is not going to be possible for me to get over to Old Lyme. I am sorry as I would like to see the other members of the Class. Possibly I can see some of them in the Boston territory a year from now as I have a boy at the Institute. He is taking Tucker's course and is expected to graduate a year from now." H. J. Schlacks not only sent greetings but a half dozen pictures of some of the work in the way of church architecture that he has done. These were passed about among the group.

Theodore Skinner sent his regards to all and sundry from Clearwater, Fla. Away back in April, Ralph Sweetser said he hoped that some client would loosen up so that he could come, but evidently nobody did. Francis Walker sent his regards. Frederick Rhodes writes: "One of the pleasant things I have always looked forward to doing after my retirement from active work was attending class reunions. Now comes the fortieth; it finds me retired but I can't be with you. For 40 years I have worked like a horse; then, two years ago, angina pectoris descended upon me. For a year I struggled on hoping to fight it off. Today I am pronounced totally disabled by the insurance people, but in spite of that I am doing pretty well, I thank you. I come down stairs in the morning and don't climb back till night. I am fortunate in having some three acres of land with considerable flower garden space and a bit of attractive woodland. Of hobbies there are plenty. Fortunately, by rare good luck, I became interested in music early in life and I still retain some facility at the piano and organ. This is comforting to me for had I specialized on flying, fishing, or mountain climbing, I should be out of luck. Within the last few years I have written a couple of books on telephonic subjects to which I have devoted the better part of my life. My enforced retirement is giving me an opportunity, which I never enjoyed before, of getting acquainted with my family. Some old philosopher said that to have rounded out his life a man should have begotten a son, built a house, planted a tree, and written a book. These conditions I have fulfilled. To come back to the reunion. As my motoring is restricted to a few miles at a time I simply can't make the journey to Old Lyme at this time, but with the continued improvement I confidently anticipate, I'll count on being with you on the Fiftieth."

As the reading of the names of those who answered with the Biblical nay, nay was interesting to those who heard them read, I will give the list here: Joshua Atwood, Harry Baker, Douglas Cater, Guy Burnham, Charles Brigham, C. H. Cogswell, William Chute, Joshua Crane, Hartley Bennet, Barron DuBois, Samuel Dodge, Ed Hall, Horace Hartshorn, Frederic Harvey, Prescott Hopkins, Elisha Lee, George Low, Daniel Lewis, Mrs. Homer Lockwood, Joseph Lyon, George May, Elmer Manahan, William Messenger, J. C. Norcross, Albert Pollard (who also sent 15 open letters to members of the class, but the Secretary did not receive them till after his return from the party so all he could do was to send them to those to whom they were directed), Edmund Sylvester, Charles Wentworth, and Walter White. — JOHN W. HALL, *Secretary*, 8 Hillside Street, Roxbury, Mass.

1895

You have been relieved of the strain for several months from poring over the happenings of '95, and therefore it is hoped your interest and support will wax strong throughout the coming school year, in making our class news one of the most interesting features of The Review.

Mention should be made of our dear mate, Al Zapf, of Orange, Calif., who has passed through two very severe accidents, but is again able to be about. Through his constant interest in class affairs, he has qualified as Assistant Secretary on the Pacific Coast. His letters have given interesting viewpoints on the Olympic games, and have also contained items of news on the Atlantic Coast. No mate could do more.

Wedding bells have kept many members of the class busy during the summer months, as sons and daughters have launched upon the sea of matrimony. Echoes of these happy affairs have reached your Secretary, and it is most pleasing to report them in chronological order, with congratulations and best wishes to all from the whole class.

The wedding of Judson Charles Dickerman to Eleanor Louise Robertson took place on Saturday, June 25, at Harrisburg, Pa. They will reside in Washington, D. C. — On Saturday, July 2, at Woods Hole, Mass., Marjorie Park, daughter of Mr. and Mrs. Franklin A. Park of New York City, was married to Gerard Swope, Jr., the younger son of Mr. and Mrs. Gerard Swope of New York and Ossining. Not every class can boast of such loyal team work among its members.

On Saturday, July 15, Philip Walley Bourne, son of Mr. and Mrs. Frank A. Bourne of Mount Vernon Street, Boston, was married to Mary Elliot Nicholson, daughter of Mr. and Mrs. George James Guthrie Nicholson of Fifth Avenue, New York City and Newport, R. I. They will reside in Cambridge, Mass. Mr. Bourne attended the Institute with the Class of 1930.

On Saturday, July 20, another and eldest son of Gerry Swope left home to marry Mrs. Elizabeth Hanson Burr, at Salem, Mass. They will reside in Philadelphia, Pa. — The wedding of Miss Catharine, daughter of Mr. and Mrs. Edward Laurence Hurd, of Milton and North Chatham, Mass., will take place at the Hurd's summer home, North Chatham, on October 1. This is an interesting record; who is next?

Mr. and Mrs. A. L. Canfield's younger son, Arthur, graduated from the University of New Mexico, and their daughter Louise was graduated from Wellesley College in June. A. L. is working up a good record also.

Our Alfred P. Sloan, Jr., has been elected a member of the Corporation of the Massachusetts Institute of Technology. — H. K. Barrows, who is President of the Northeastern Section of the American Society of Civil Engineers, has been retained to report on the enlargement of the Sugar Hill reservoir of the Vermont Public Service Corporation at Goshen, N. H.

We learn from the Washington Bureau of the *Sun*, that the Reconstruction Finance Corporation has appointed an engineer's advisory board of five to assist in passing upon the merits of all self-liquidating construction projects which it will be asked to aid under the provisions of the emergency relief act. Among

1895 Continued

the five engineers is Professor John Herbert Gregory, Professor of Civil Engineering at Johns Hopkins University, and Technology '95.

"Professor Gregory, who has been associated with Johns Hopkins University since 1920, is a native of Cambridge, Mass., and received his engineering training at the Massachusetts Institute of Technology. He has had extensive experience in the field of municipal water supply, having been connected with such projects in Boston, Albany, Jersey City, New York, Columbus, Newark, Baltimore and other cities. Professor Gregory's work in connection with improvement of water and sewage systems in Columbus was so outstanding that he was awarded the Thomas Fitch Rowland prize by the American Society of Civil Engineers. He also was awarded the James Laurie prize for his work on the O'Shaughnessy dam and reservoir.

"The Baltimore member is the author of a large number of papers and articles on water supply, and is a member of the board of directors of the American Society of Civil Engineers. He also belongs to the American Public Health Association, the American Water Works Association, the Society of Municipal Engineers and the New England Water Works Association."

Last but not least, we hear that our own Johnnie Moore has materially assisted in the successful outcome of the Democratic Convention at Chicago. We are promised a great treat at our next reunion, where he will recite in verse, "The Experiences and Secrets in Politics." — LUTHER K. YODER, *Secretary*, Chandler Machine Company, Ayer, Mass. JOHN H. GARDINER, *Assistant Secretary*, Graybar Electric Company, Graybar Building, New York, N. Y.

1896

The Secretary celebrated his birthday the last of August by fracturing his right arm close to the shoulder. Fortunately this did not put him in bed, but necessitated that the arm be strapped tight to his body, which of course restricted his activity. Otherwise the Secretary is carrying on as usual.

John Rockwell, with his wife, went to New Jersey the early part of the summer to attend the wedding of the nephew of Billy McAlpine, and there he came face to face with Billy, whom he had not seen for 20 years or more. Billy is now consulting engineer for the Government on the Mississippi watershed east of St. Louis. His physiognomy has shown little change and, furthermore, he is very active physically, playing tennis, golf, and similar games, which keeps him young. Rockwell was one of the officials for the national wrestling tryouts for the American members of the Olympic team at Columbus, Ohio, in July and from there he made his usual yearly trip to Harriman, Tenn. Returning by way of Richmond, Va., he had the interesting experience of occupying a sleeper in the first air-cooled train going out of Richmond. Later he made a trip to Los Angeles with Mrs. Rockwell, where he was one of the judges of the wrestling at the Olympic games. He made his headquarters at the Jonathan Beach Club at Santa Monica, thus gaining all the advantage of the long California evenings at the beach and driving up in the daytime in a friend's car to the games. By virtue of being a judge, John had a pass which admitted him to a definite section in the various athletic stadia where, when not on duty, he saw games of all kinds including track meet, equestrian, swimming, boxing, fencing, football, soccer, to say nothing of gymnastics and field hockey, in fact about everything but rowing. Rockwell was most enthusiastic over the spirit of honest competition and friendliness on the part of the contestants. He feels that if world conditions could be governed by the good feeling and courtesy, lack of resentment or feeling of unfairness which governed the Olympic games, we should have no international difficulties. From Los Angeles he went to San Francisco and had the pleasure of lunching with Charlie Hyde across the bay at Berkeley and looking over the University under his guidance. Charlie, you will recall, was burned out along with some of the other professors sometime ago. This apparently reacted to his advantage, for John reports that he is now living in a beautiful stone house with windows particularly adapted to give a wonderful view of the Golden Gate and the sunsets for which California is famous. Eureka, Calif., was his next stop. Here he spent a day and night with some friends and took a 160-mile motor trip through the big redwood forest. He returned home by way of Victoria and Vancouver, British Columbia, stopping in Detroit, where he tried to get in touch with Mark Allen, but unfortunately he was not at home. — CHARLES E. LOCKE, *Secretary*, Room 8-109, M. I. T., Cambridge, Mass. JOHN A. ROCKWELL, *Assistant Secretary*, 24 Garden Street, Cambridge, Mass.

1899

Ponce de Leon has nothing on D. C. Churchill, of Berea, who has invented a new Fountain of Youth in the form of a swimming pool. Now there are swimming pools and swimming pools, but Churchill's is unique in that it was intended for something else. Into it its happy inventor has dived every morning but one for a year (except when he was out of town) and the daily dip is a therapeutic adjunct that he recommends to all who read. As the winter advanced, he found it not so easy to pursue his Spartan course and it took a bit of flagellation of the spirit to keep him in line. When the ice froze to the thickness of one inch he was inclined to call it a day, but thinking better of his fall from grace he secured a two by four scantling, carried it down to the pool and "wished for day." Day came and broke at 10 degrees above zero which was more than Churchill had bargained for. He broke the ice with the scantling. He argued then that he would bark himself on the jags, but he conquered that "wishful thinking" and broke off the jags. The devil then suggested that he might not find the hole on the way up, but he had by this time achieved a mighty determination, so he ran around and broke a hole on the other side of the pool. Then he plunged. The little journey between holes under the ice was navigated without a hitch, and a rub-down afterward made breakfast a thing to be remembered.

With true brotherly love, Churchill desires to share his discoveries and inventions with the rest of us, but few are so fortunate as to have a swimming pool as one's own private possession and if we should go in for this Ponce de Leon business, we would most of us get into difficulties. For instance, should I follow Churchill's example I should have to choose a government reflecting pool and there are regulations concerning their use for bathing purposes. The authorities might not molest one who so much desired an icy plunge that he would break holes in the ice to get it. However, after eluding the park authorities, one on bathing bent would have to run the gantlet of the alienists at the government's receiving station for the mentally abnormal — and that is too high a price to pay for even therapeutic adjuncts of great value. I fear that for many of us the Fountain of Youth stuff will have to be abandoned.

Lew Emery is junketing in Ragusa. He announced the news briefly by postcard. Mayhap I can inveigle him into penning a paragraph giving details of his journey.

Arthur E. Hoxie, listed among the missing since 1926, is now residing at 412 Wolcott Street, Auburndale, Mass. Mail addressed to Leonard H. Field, Detroit, Mich., B. G. Elliott, Newtonville, Mass., Harry W. Goldthwaite, Chicago, and C. W. Swift, Waban, Mass., has been returned to my office bearing large, red, finger-pointing comments from the postal authorities more terse than polite. Can anyone provide me with correct addresses of these men? I am loath to drop them from our shrinking active list but the objurgations of Uncle Sam may force me to do so. I have heard vicariously that Goldthwaite's daughter was married early this season and for this bit of news I am grateful to Ben Morse.

It has been reported to me that a Technology Club is to be formed at Wilmington, Del., and a meeting was held last Spring at which Colonel Locke was present. They had a delightful evening with a dinner enlivened by informal speech making. With about a hundred Tech men in the vicinity of Wilmington, they expect to form a good live chapter. Norman Rood reported the meeting and he followed his report with a series of comments and requests that I shall pass on to you verbatim.

"At the dinner I (Norman) asked for a certified copy of the M. I. T. yell, and no one could supply it. Everyone remembered there were a lot of 'Rah-rahs' in it, and as we were served oysters at the dinner that seemed to fit the occasion. However, while we old timers all remember what the Tech pin is like, we used the yell so seldom that we have forgotten it.

1899 Continued

I think it should be printed on the title page of the 'Register of Former Students' or somewhere else where we can refer to it. Why not in the *Encyclopedia Britannica* for ready reference.

"Of course I have been out of Tech a good many years and most of the time out west where Tech men used to be scarce, though we did have a Tech dinner in Joplin, Mo., at least 20 years ago with 25 men present. So I am asking has the Tech pin design been changed since 1897 or 1898? If we wore an old pin to an alumni dinner would any of the youngsters know what it was? Is the Tech emblem ever published anywhere? If not, why not? Did Tech ever have a college flag? If so, where did they keep it? Can flags be secured now? If so, where? We may need one in Wilmington."

After mailing my last contribution to The Review in the spring, I received a letter from Frederick W. Caldwell, Montreal. He had spent the winter in Massachusetts and, fresh from Canada, he could see many things that those of us who live here cannot or do not see. For one thing, he found that many of our industries were working on old-fashioned policies, among them high capitalization of good will. When he read over the Constitution of the State of Massachusetts he found very little left of the original. Apparently the people still have the right to petition the legislature and not much else. Caldwell felt and in this many will concur that there is a very great need for intelligent reorganization of all government activities in the U. S. A.

It is with deep regret that I record the death of four members of the Class. Walter Butler, in London, England, July 1931; Florian Lacaff, of pneumonia, Phoenix, Ariz., June 1931; Albert L. Babbitt, Newton, Mass., April 23, 1932; and Everett Hinckley, April 29, 1932. Hinckley was driving from his home in Mamaroneck, N. Y., to Boston, where he had an appointment with Hervey J. Skinner, when his automobile skidded off the road into a rock pile at Woodbury, Conn. Hinckley was killed and his wife seriously injured. — W. MALCOLM CORSE, *Secretary*, 810–18th Street, Washington, D. C. ARTHUR H. BROWN, *Assistant Secretary*, 53 State Street, Boston, Mass.

1901

These notes, penned as usual on the hilltop in Vermont which I inhabit during the summer months, signal the resumption of the winter's activities. The Editors of the Review, contrary to the habit of all other mammalia — the term is generic and embraces the poorly equipped males as well as the richly dowered females of the comprehended species — hibernate during the summer months, and resume their activities with — as the poet has so touchingly expressed it — "the wa' gang o' the swallow." For Charlie Auer's benefit, he living in that Eden of the border, El Paso, I will add that this refers to the bird, and not the pleasing act of deglutition. This is perhaps the easiest to write of my yearly contributions to American *belles lettres* as at this blessed season I am in full receipt of those "interesting news regarding yourself or any other '01 man" that emanate from the faithful few. And they are few but, God, they are faithful. Some day I'm going to prepare a Golden Book to record their names, headed by our peripatetic member, Frederick G. Clapp.

Speaking of whom, I have received a pathetic word anent the Reunion of 1933 in which he says it is useless to sign up, as if he gets any time off during the summer — which is improbable — he'll join the family. And after all that's reasonable for they must have lost track of him considerably during the years that he spent sitting on Teapot Dome, and ranging the unharbored heaths of Mongolia, Alaska, Australia, New Zealand, Persia, Bronxville, and other way stations. At that I'll bet the children are fond of him, for by now he must have assumed the dignity of a myth, hallowed by tradition, wrapped in the mists of romance. Some day I hope he'll write the Saga of the Peaceful Wanderer — and make me his literary executor. For the moment, he is in retreat at 49 Warwick Road, Bronxville, N. Y., having just returned from Cuba by way of Texas.

Well, anyhow, I saw Alexandria, the Strawberry King's pocket borough, and say — was you ever in New Orleans? But I weep with the purest envy when I think of the legitimate nobility of a Petroleum Engineer.

On the other hand, Leroy Backus of Seattle has an olive branch — in this case an hibiscus — who graduates (D.V.) from the Institute next spring and he is going to take in son's graduation as a pendant to attendance at the Reunion. The Firemen of Hose Cart 5 are hereby officially notified of the impending conflagration. I plan to participate. As one of Leroy's vocations is Fire Insurance, coupled with the management of business properties, a pleasant gathering is assured for all. Theme song — There'll be a Hot Time. . . . That strikes a chord in the breasts of the veterans of '98.

And, the Strawberry King, God bless him. Though I missed him on my southern sojourning last spring, his was the guiding hand that — vicariously — led me from Washington to Richmond. Al is now President of seven operating companies and their subsidiaries in the electric light and power industry. And, boy, does he shine! The "activities of the companies take him into eight different states" along the Atlantic seaboard. And the less favored common- and other-wealths away from salt water are reaching out greedy hands. Al will not only attend the next Reunion but he will bring with him a unique antique acquired by him as he passed hurriedly through the eight states — and a few more. It is a barrel organ, fabricated by that master craftsman, Benvenuto Cellini, and brought to this country by one of his descendants *au main gauche*, another triumph of art. The original monkey and several descendants have been worn out, but I am organizing a group of Morris dances to be performed by selected members of the Class, led in the revel by the melting strains of the instrument as evoked by the owner's master hand. It is uncertain as to which day of the Reunion this *chef d'oeuvre* is to be offered to an enthralled and exclusive public, so plan to come for the whole show. Small fruits — a tribute to the collector — will be distributed both before and after the ceremony.

Turning for the moment to a most apposite matter, I quote from a recent letter of Lammot du Pont — of whom more in a later communication.

"The following incident might be of interest: Last April 8, as President of the du Pont Company, I sent out a circular letter to stockholders, employees and friends of the Company, pointing out the volume of expenditures of the Federal Government as compared with prior years, and urging the party addressed to communicate with his Representative in Congress in an effort to get some action toward reduction of Federal expenditures. I do not claim credit for the wording of the letter, but was extremely interested in the object which it was hoped to accomplish.

"Although the letter called for no reply, a large number of replies were received and it is interesting to note the following facts obtained by classification of these replies.

"Ninety-seven per cent of the replies were in accord with the idea of reduction of Federal expenditures.

"Seventy-one other corporations expressed their intention of sending a similar circular to their stockholders, and/or employees, and/or friends, and/or customers.

"Eighty additional corporations and individuals expressed their intention of taking some similar action, not in the form of a circular letter.

"The result of this effort on our part indicated to me quite clearly that there was a very widespread feeling in favor of reduction of Governmental expenditures. In my opinion, this is a very hopeful sign for the future."

If others would follow this example, a widespread public opinion could be created that might be of real service. Be "great engineers" if you like, but for the sake of the future don't be "silent" with a silence that reverberates its platitudinous inconsistencies. A polysyllabism that suitably ends my modest screed. — ALLAN WINTER ROWE, *Secretary*, 4 Newbury Street, Boston, Mass.

1904

On the date when the notes for this issue were due in The Review office, the Honorable Secretary of the Class of 1904 was in the wilds of Vermont, enjoying his well-earned annual vacation. Hence, the report of the Annual Reunion, and such other items of news as he has been able to accumulate, will positively appear in the November issue.

And as far as notes for this issue are concerned, as Ethel Barrymore once said, "That's all there is! There isn't any

1904 Continued

more." — HENRY W. STEVENS, *Secretary*, 12 Garrison Street, Chestnut Hill, Mass. AMASA M. HOLCOMBE, *Assistant Secretary*, 3305 18th Street, N. W., Washington, D. C.

1906

The following letter was received from George Hobson from Paris, France, dated May 17: "Was much astonished to read in the March Technology Review that I was 'listed among the missing' in Class 1906 news. Seems almost like war times again. As a matter of fact, I was under orders to sail for the Philippines last August 19, but six days before I was due to leave, the 'Powers that be' decided that I was to come over here. As far as possible, my household goods were pulled off the transport and are now in storage at Schenectady, part in Philadelphia Depot. My wife and young son, Jack, came over here with me, but the climate did not agree with the boy so they had to return to the States last February. My elder son, George, enters West Point in July, having won a Presidential Appointment. So here I am in Paris, with my family and belongings scattered to the 'four winds of heaven'. Such is life in the Army. — The detail over here is extremely interesting. At present I am finishing up projects for the monument at Montsec (Meuse) and the Chapel, Entrance and Service Building for the American Military Cemetery at Thraucourt (Meurthe et Mosellè). Later there will be a project at Gorry (Aisne), after which I expect to return to the U. S. A. during the summer of 1933. All our work is done through the medium of French contractors and as they will only do their own special kind of work, it means 30 or more contracts for one building. One particular difficulty is to coördinate the various contracts and yet get rapid progress. Time seems to mean nothing to the contractor and each one wants to finish his particular work before another contractor starts in. And there is a lot of 'parlez-vous ing' when we make them work simultaneously. So it goes, and in spite of small aggravations, it has been very interesting. Incidentally, this daily shifting from English to French has got me in a state of mind that I can neither read, write, nor spell in either language — so please forgive any errors."

Electrical Engineering, which is the publication of the American Institute of Electrical Engineers, includes the following in its August issue with reference to Otto Blackwell: "O. B. Blackwell, now transmission development engineer of the American Telephone and Telegraph Company, New York, N. Y., shared in the 1931 A.I.E.E. national prize for the best paper on engineering practice, for the paper which he prepared jointly with H. L. Wills and which was entitled 'Status of Joint Development and Research on Noise Frequency Induction', being an integral part of the symposium on coördination of power and telephone plant to which the prize was awarded.

"Mr. Blackwell who was born at Bourne, Mass., and in 1906 received his B.S. degree from Massachusetts Institute of Technology. He at once entered the engineering department of the American Telephone and Telegraph Company, and in 1915 was placed in charge of transmission and protection, a subdivision of the department. Here he was given the supervision of some 40 technically trained men on important development and standardizing work of telephone transmission and protection circuits. By his collaborators Mr. Blackwell's work always has been recognized as uniformly of the highest grade. In fact it has won recognition for him throughout the entire telephone world. For a period of more than seven years, much of his work was looking toward the extension and betterment of telephone transmission through the use of loading coils, improved cable construction, telephone amplifiers, and similar electrical equipment. Illustrative of his work is the design of a standard transposition system for lines carrying phantom circuits, important work on the development of duplex telephone cables, and contributions of great importance to the successful use of telephone repeaters on long lines. He is a Fellow of the Institute of Radio Engineers and of The Acoustical Society of America; he also holds membership in the Machinery Club of New York City, the Manhassett Bay Yacht Club, and the North Hempstead Country Club."

The Secretary acknowledges a copy of the Weekly Bulletin of the Engineering Association of Hawaii, thanks to Bill Furer. This particular copy includes an account of a luncheon meeting on July 8 at which Dr. C. E. Turner of M. I. T. spoke to the Society. Dr. Turner is giving a course in Public Health at the summer session of the Institute of Hawaii. The Bulletin was prepared by Bill Furer who is Secretary of the Society.

Harold Coes passed through Boston on Tuesday, July 26, on his way to the Cape for a vacation, and tried to get in touch with the Secretary, who, unfortunately, happened to be absent from the office on that date. Under the date of June 8, a letter was received from Harold which included the following: "I tried to get in touch with you by telephone when I was in Boston recently but you were out and I had no further opportunity to communicate with you. Professor Schell, Head of the Department of Business and Engineering Administration, had asked me to come up to Cambridge to talk to the senior class. He also arranged for me to meet, at luncheon, several of the fellows in this course who are doing some interesting things and I greatly enjoyed the opportunity of meeting them and discussing with them some of our current problems. Next time I am in Boston maybe I will have better luck in getting in touch with you but my time was so extremely limited last time I was there and scheduled right up to the time the train left to return to New York, that it left no opportunity to deviate from it. However, I have recently been appointed a member of the Visiting Advisory Committee on my old Course II and very likely I will have to make a trip to Cambridge in the fall or early winter to attend one of these committee meetings. I have not seen Charlie Wetterer, although I have talked to him several times over the 'phone. It is my own fault that I have not seen him but, as a matter of fact, I have been away a good deal. I imagine Mrs. Wetterer has probably gone down to the Cape for the summer so perhaps if Charlie is going to 'bach' it here this summer, I will get him to come out home."

The Covington (Ky.) *Post*, issue of February 26, 1932, included the following: "Frank G. Baldwin was elected president of the Technology Club of Cincinnati at the annual meeting Thursday night at the University Club."

The Secretary had an opportunity to renew Technology associations this spring when he was asked to participate in giving the Comprehensive Examination taken by the graduating Course VI Honors Students. The Course VI classmates in particular will be interested to know that the present undergraduates in the course who attain high standing at the end of the Sophomore year are put in a so-called "Honors" group. Under this system, the men are left largely on their own. They take weekly and term tests but omit the final tests at the end of the last term of the Senior year. At the end of the last year, they are given a Comprehensive Examination covering general engineering subjects included in their course and they are allowed 100 hours to prepare their answers. The day at the Institute was devoted to discussing the questions with the students and judging the students from the personal interview and from their six-minute presentation of one of the problems before the combined group of the committee and the other students. It was interesting to note that of the 15 highest men in a graduating class of approximately 460, nine of the 15 Course VI Honors men were in this group. Incidentally, Otto Blackwell acted as a member of the Examining Committee in 1931.

A letter was received from Professor Gill in May announcing the death of Arthur Neale, V. Professor Gill writes that Neale was "his assistant for a year — a keen, alert, capable young fellow who was educated in Ireland and finished his study here." In 1914 and 1915 Neale was in Wisconsin, but from 1918 to 1926 he was on the West Coast at Seattle in connection with a Fish Oil plant. When that plant ceased operations he spent some time in Chicago and for a while was with a paper company at Port Edwards, Wisc. The year before his death he had a serious operation from which he really never recovered. — JAMES W. KIDDER, *Secretary*, Room 505, 261 Franklin Street, Boston, Mass. EDWARD B. ROWE, *Assistant Secretary*, 11 Cushing Road, Wellesley Hills, Mass.

1907

The Twenty-Fifth Reunion of the Class was held at the Oyster Harbors Club, Osterville, Mass., on Friday, Saturday, and Sunday, June 17, 18, and 19, 1932, the advance guard of the class reaching

1907 Continued

the club just before lunch on Friday, and in spite of the heavy downpour of rain most of the main body reached the club Friday afternoon.

The afternoon was spent around big fires in the club living room getting acquainted all over again, swapping yarns of the old days at the Institute and wondering "who in heck that fellow is who is just arrived" and greeting the newcomers hilariously when they were at last identified. Late in the afternoon the sun broke through the clouds and a few of the hardier spirits went out for a rather moist nine holes of golf on the wonderful Donald Ross course.

Friday evening the whole gang jammed into Macomber's room, where John West, Harvard '07 and Mac's business partner, was officially adopted as an honorary member of the Class. He showed his appreciation of the honor by producing a mammoth guitar which he whanged wickedly and, with Stud Leavell as soloist, led the Class in all manner of ribald songs.

Sam Marx entertained us with a large number of his inimitable stories, while Stark and Beeb Hosmer staged a number of wrestling bouts which, in the restricted space, did more damage to the on-lookers than to the contestants.

Stark, Hoz, and Harry Moody came down in Stark's palatial (!) yacht, but they evidently had a rough passage as they seemed somewhat the worse for wear and the engine room force, in particular, had evidently been working over time. Hoz appeared in his well-known moccasins, a beret, and a beautiful faded pink jacket which would have taken first prize in any sartorial contest staged.

Saturday was a wonderful day and most of the class spent the day on the golf course, while the non-golfers went in for motor boating and automobile trips around the Cape. No particularly good golf scores were turned in as Donald Ross had evidently reached the conclusion that the nature of the soil had made it much easier to build sand traps than to grow grass, and niblicks and mashie-niblicks were the most popular clubs in the bags.

The Class Dinner on Saturday evening was a hilarious affair with the whole crowd gathered in the grill room which we had as our exclusive property for the evening. The meeting degenerated into a regular Democratic Convention with Stud Leavell leading the reactionaries in an attempt to oust the old administration. Stud's speech chastizing Mac for his gross breach of class etiquette and daring to join the ranks of the benedicts without first obtaining the approval of the class was wonderful, but in spite of his impassioned oratory, the old administration was returned to power. Bryant Nichols was reëlected Secretary and in order to distribute the burden of class administration, Wonson was elected Treasurer.

A great many of the men who were unable to get down for the reunion sent in a sheet of statistics and the Class was tremendously interested in what had happened to the members of the old gang since June, 1907. Tashjian brought along his movie projector and threw on the screen some of the highlights of the Twentieth Reunion. Mac, the provider, seriously underestimated the Class capacity as some of the most essential ingredients were exhausted before the dinner was over.

More golf Sunday morning, and then soon after lunch farewells were said and the crowd began to disperse to the four corners of the United States after the finest reunion ever.

Those present for at least a part of the reunion were: Charlie Allen, Dirk Ashenden, Bert Bancroft, George Crane, Fred Dempwolf, Seymour Egan, John Frank, George Griffin, Tom Gould, Fred Moses, Tucky Noyes, Ralph Hall, Hudson Hastings, Herb Hosmer, Ralph Hudson, Bob Keyes, Stud Leavell, Ralph Lowe, Frank MacGregor, Alexander Macomber, Herman Mahr, William H. Martin, Sam Marx, Kenneth Moller, Harry Moody, George Otis, O. L. Peabody, Ed Prouty, Don Robbins, Ed Squire, Gilbert Small, Oscar Starkweather, Phelps Swett, A. H. Tashjian, Phil Walker, Harold Wonson, Dick Woodbridge, and Bill Woodward.

Edward L. Moreland of the firm of Jackson and Moreland described the suburban electrification of the Delaware, Lackawanna and Western Railroad at the meeting of the Boston Section of the American Institute of Electrical Engineers on April 21.

In the Boston *Herald* of August 7 the following announcement appeared: Mr. Chester A. Vose of Marion announces the engagement of his daughter, Miss Carol Vose, to Mr. Daniel Putnam Abercrombie, Jr., son of Mr. and Mrs. Daniel Putnam Abercrombie of Manomet. Miss Vose attended Tabor Academy, Bradford Academy, and Miss Wheelock's school. She has been a member of the faculty at Derby Academy in Hingham. Mr. Abercrombie is a graduate of Deerfield Academy and is now studying at the Hyannis airport.

Remember Major E. Dexter Boles, M. I. T. Corps of Cadets, when we were freshmen? He has been entirely lost as far as your Secretary is concerned for years, but the June 12 issue of the Brooklyn (N. Y.) *Eagle* brings him back to our fold. In an article describing the personnel of the management of the new municipal subway of New York, Dexter is named as power engineer with a salary of $6,000, and the following comment: "Dexter Boles, Power Engineer, attended Medford (Mass.) Grammar School, English High School, and M. I. T., from which he was graduated in 1907. He was engaged in construction and electrical engineering with the General Electric Company in Schenectady, Dwight P. Robinson and Company, and Stevens and Wood, Inc., in New York. He was engaged by the Board of Transportation five years ago in charge of the power system for the new subway." — BRYANT NICHOLS, *Secretary*, 19 Rowe Street, Auburndale, Mass. HAROLD S. WONSON, *Assistant Secretary*, Commonwealth Shoe and Leather Co., Whitman, Mass.

1909

During the summer a number of the Class have dropped in to say "hello" while passing through Boston, and it has been a pleasure to have seen them.

Austin Keables, who has been with the Green Fuel Economizer Co. at Beacon, N. Y., has been renewing his acquaintances in New England. — Arthur Morrill reports that he is no longer associated with the Detroit Water Department. — James Dean is City Manager of Sacramento, Calif. — John Willard's daughter, Virginia, was graduated from Vassar College last June. — During the summer I learned of the death of John J. Hynes, on April 27, 1932, at Buffalo, N. Y.

It was good to hear from John Hatton, who writes: "Architecture has been pretty well closed down for the past three years but I have been lucky enough to have a few small store jobs to barely keep me going. By chance I got going on a new idea in retail store interiors and fronts and have had considerable success with several of the leading merchants in New York.

"Last Monday, the town of Harrison, N. Y., dedicated a bronze commemorative plaque which I was commissioned to design for Amelia Earhart Putnam. I made a modern representation of the front of her Lockheed Vega plane including a swell pair of polished bronze blades which she liked a lot.

"One of my Fifth Avenue jobs, the store for Peck and Peck, has been chosen by the Museum of the City of New York as the most outstanding modern store front of this period and they are going to make a model of it for the history of retail merchandising in New York." John's office is at 665 Fifth Avenue, New York City.

Paul Wiswall is planning a class luncheon in New York for the latter part of October. Give him a ring if you are to be in town at that time. — CHARLES R. MAIN, *Secretary*, 201 Devonshire Street, Boston, Mass. PAUL M. WISWALL, *Assistant Secretary*, General Foods Corporation, 250 Park Avenue, New York City. MAURICE R. SCHARFF, *Assistant Secretary*, 1 Wall Street, New York City.

1910

Ralph Horne writes: "Replies to your request for letters written in the first person should not require a great deal of space, under present business conditions. — Since 1922 I have been a partner of Fay, Spofford and Thorndike, Consulting Engineers of Boston. All of our partners are former Tech men; they include Frederic H. Fay and Professor Charles M. Spofford, of the Class of '93, John Ayer '05, Bion A. Bowman '09, Carroll A. Farwell '06, and yours truly '10. Our firm activities are primarily on municipal work and include bridges and buildings, port developments, wharves, and general water-front projects, grade crossing eliminations, sewerage, drainage, and waterworks. My personal duties are the supervision of the firm's work on water works, sewerage, and drainage projects.

1910 Continued

"This year I have the privilege to serve as President of the Boston Society of Civil Engineers, which is the oldest civil engineering society in this country. I have associated with me several members of M. I. T. '10, including Jack Babcock, who is one of our Society Vice-Presidents, and John Wentworth, Bill Keefe, Herb Cleverdon, and Ted Joy, all of whom serve on important committees.

"My duties with the Boston Society of Civil Engineers have led me to become one of the incorporators of the Emergency Planning and Research Bureau, Inc., which has raised voluntary contributions from engineers and their associates amounting to about $75,000 for employment of jobless members of the engineering profession in Boston and vicinity. These men are given employment by the Bureau, at a modest wage, on fact-finding work of a technical nature. The services of the Bureau are given, without any charge, to municipalities of Metropolitan Boston. To date, about 225 men have been employed by the Bureau and about 50 others have secured work through the Bureau, which operates a free employment service for all engineers who register as unemployed.

"I have not found it difficult to keep reasonably busy either on my firm's work or on engineering society work, even though it is quite apparent that this much dis-'cussed' period of business depression is a reality."

Gordon Holbrook came to life with the following: "In reply to yours of July 31, I am hastening to accept my election to the select body of contributors to The Review from the Class of 1910. I look for the Class Notes regularly and realize each time that I am one of the reasons for their scarcity.

"For the past 12 years I have sojourned on the Kearny Meadows and am General Superintendent of the Federal Shipbuilding and Dry Dock Company, a subsidiary of the United States Steel Corporation. Singularly enough the present year is our busiest since I have been with the Company, which is some compensation for the dull time the shipyards have had while other industries were booming. We are over the hump in man power now, however, prospective job seekers please note, and the outlook for next year is not as rosy. — I am the provider for a wife and two children, a boy of 15 and a girl of 12. The two last-named are at camp this summer, hence the old folks stay close at home in Maplewood, N. J. The boy seems to show more tendency to take to the air than the water for his natural element, but that is all right if he prefers it.

"Tech men I see most often are Dick Ranger, Bill Orchard, and Art Lunn at the Newark Rotary Club, also Walter Spalding and once Don Stevens. French Sargeant and Ragsdale are the only Course XIII men I have seen in this locality. I hope more will get in touch with me when in the Metropolitan district." — We wish we had more letters like the above to publish in the notes. — DUDLEY CLAPP, *Secretary*, 40 Water Street, East Cambridge, Mass.

1911

As these notes are being typed the total eclipse of the sun is but a week off and things are certainly looking up at Douglas Inn, for we are located in the direct path with 97 seconds of totality. We are expecting some '11 men and are proud that President Compton has chosen here for his family party to the eclipse.

Summer is never a big producer of class letters, but this year the minimum since graduation has been reached. Let's not be discouraged, however, maybe that means classmates are too busy to write — better times are already here.

Dick Ranger has been reëlected President of the Technology Club of New York. So has Don Southgate at Nashville for the M. I. T. Association of Tennessee. We're also delighted to note that Burleigh Cheney is now President of the Technology Club of Rhode Island.

Bill Warner, now Chairman of the Board of Commissioners of Nowata, Okla., or virtually mayor of the city, wrote a while ago that he had a big job one day in May, distributing a car of flour for the Red Cross. Bill and Mrs. Warner have a son ready for college, and two other sons on the way. All are athletic, the older being track captain at his prep school. — Harry Tisdale has been transferred by the American Dyewood Company from Schenectady to their office at 100 East 42nd Street, New York City. — Royal Barton's wife is successfully recuperating from a serious operation. He is still with Electric Bond and Share in New York City.

H. Stokes Waite, II, died at his home in London, England, May 6. No details have been received. — Our class baby, Phyllis Glazier, daughter of Mr. and Mrs. Gordon Glazier graduated from Mount Holyoke this June. — Tom Killion, III, writes that he is now at Green Harbor, Mass. He has an interest in a small boat business, featuring canoes, outboard runabouts, dinghies, and small sailers. — Carl Richmond, I, saw Sam Hayes, V, recently in Hartsville, S. C., adding that a recent letter from Julius Waldstein, I, stated he was "in the midst of a very serious personal depression."

Have you seen the recent Goodyear advertisement with good old Burgess Darrow, VI, manager of Goodyear's Development Department, pointing with pride to a huge Goodyear Airwheel Tire 12 feet high and four feet wide?

Harold Davis, VI, of Nashua, N. H., has devised a plan for Governor Winant of New Hampshire, known as "The New Hampshire Plan for Reemployment." Basically, it provides for shortening the hours of the present workers, with the view of adding others to the payroll. The plan also provides for future compensations that will benefit those who make the sacrifices now.

Write to Dennie! — ORVILLE B. DENISON, *Secretary*, Douglas Inn, Douglas Hill, Maine. JOHN A. HERLIHY, *Assistant Secretary*, 588 Riverside Avenue, Medford, Mass.

1912

By the time these notes appear, all members of the Class should have received a mimeographed report of the great 20-year Reunion. Copies were mailed to the entire list as per the Alumni Office stencils. So we won't take space here to repeat all the details. In spite of the depression, in spite of poor attendance at previous reunions, in spite of pessimists who couldn't see anything but failure, the Class of 1912's 20-year Reunion was an outstanding success from every point of view.

We doubt if any other classes, except perhaps the very recent ones, have been able to bring out an attendance of 47 classmates, or a total of 90, counting wives and guests, at a gathering of this kind.

We started with a luncheon at Walker Memorial on Friday, June 17, with several present and former members of the faculty as our guests. Then we motored to the Mayflower Hotel, Manomet Point, Plymouth, Mass., where the festivities went on almost continuously until Sunday noon, the 19th. Baseball, golf, bridge, poker, dancing, and movies of former class gatherings helped to keep everybody amused.

Classmates and their families arrived from all over the country. New York, Philadelphia, Baltimore and Washington, D. C., were represented, as well as Albany, Syracuse, Buffalo, Niagara Falls, and Chicago. But the long-distance record went to Mr. and Mrs. Donald Bent who came all the way from Tucumcari, New Mexico. Everyone left declaring that they had had a thoroughly happy time and vowing to return to the 25-year Reunion and bring the other classmates along.

So we feel that our five years of persistent publicity and propaganda for this Reunion have been justified, and that the Class of 1912 has proved itself as possessing plenty of spirit and loyalty.

Your Assistant Secretary has had visits from W. A. Rhodes, VI, and C. B. Vaughan, II. Rhodes, who is an engineer for the A. T. & T. Co., has been devoting considerable time to a broad plan for economic recovery and for the control of industrial and social forces. His plan has been reviewed and favorably commented on by several economists and business paper editors. Vaughan is devoting himself to the merchandising of electrical appliances.

We also had a fine visit from Professor C. Frank Allen, who was in New York recently to discuss matters with the publishers of his books. He seems to be thoroughly enjoying life. With Mrs. Allen, he does quite a bit of traveling, attends Technology gatherings, and keeps up an intense interest in current events.

We have been reliably informed that Miss Georgia McCormack, daughter of C. D. McCormack, I, graduated last June from Jackson College, where she specialized in French. A year ago she took her Junior Courses at the University of Toulouse, France, where she passed with honors.

1912 Continued

Early in July we received a letter from Mrs. Canaday, wife of W. A. Canaday, II. Mrs. Canaday was, as far as we know, the only casualty case of the Reunion at Plymouth. She had the misfortune to incur a very badly sprained ankle while going down the slope to the field where the baseball game was under way. Her letter informed us that the injury was severe, but that she was recovering the use of her foot gradually. We hope that by this time she is completely over the painful episode. — FREDERICK J. SHEPARD, JR., *Secretary*, 125 Walnut Street, Watertown, Mass. DAVID J. MCGRATH, *Assistant Secretary*, McGraw-Hill Publishing Company, Inc., 330 West 42nd Street, New York, N. Y.

1913

Scarcely any news has come across your Secretary's desk during the past three months. Let us hope the coming season will be more fruitful.

Ken Hamilton, as mentioned in previous notes, is with the Norfolk Paint and Varnish Company of Wollaston. His new business takes him often into Boston and Cambridge. He is lunching frequently at Walker Memorial, reabsorbing Technology atmosphere as he calls it. Have had a few pleasant chats with him. — Saw Cotton the other evening on the street. He is still enjoying life and not worrying. Does not change much as time goes along.

E. G. Brown, we learn from good authority, is back in town after a two-year absence in Russia. Perhaps Brownie will loosen up and give us a three-star edition for the next issue of the notes.

We also learn that our genial Secretary, Phil Capen, is now with the Mansfield Company of Canton, fishing tackle manufacturers. His work includes that of efficiency engineering. We do not know whether that applies to the work inside the plant, or has to do with the use of the tackle in procuring more fish. Perhaps Phil will tell us more about it. — GEORGE P. CAPEN, *Secretary*, 50 Beaumont Street, Canton, Mass. ARTHUR L. TOWNSEND, *Assistant Secretary*, Room 3-435, M. I. T., Cambridge, Mass.

1914

It is with profound regret that we have learned of the death of George W. Harding on October 18 of last year, at Richmond, Va. No further detailed information has been received. Harding was one of the group that came to Technology from Fall River and who was active in various Course I affairs.

The economic disturbance has had its effect on '14 men as well as on other engineers. Fortunately, its effect has been in a large measure not as severe as has been its effect on engineering in general. Many of our classmates are working on short time or with reduced salaries, but fortunately there appears to be only a small number without work. Perhaps the great diversification has helped in this. Our records show that a very considerable number are in executive positions of a somewhat nontechnical nature.

Ted Gazarian reported, rather late to be sure, the arrival of a son on January 24. At the same time, Ted also told us that he had neglected to report the arrival, four years ago, of a daughter. Perhaps there are a lot of other '14 men who have neglected to report these vital statistics. If so, it would be greatly appreciated if they would report them to your Secretary now, in order that the Class records may be brought up to date. Gazarian is one of those who has drifted somewhat away from engineering. He is a partner in a firm of importers whose business is the importation of sausage casing, pistachio nuts, and Oriental rugs.

About equally divorced from engineering is Charlie Hull, who, for the past 12 years, has been with that famous Boston store, "Raymonds, Inc." He is now buyer for the work clothing department, which he comments on as quite a change from his architectural training. Your Secretary hazards a guess that, in view of present conditions in the building industry, it is probably more remunerative than the architectural profession. It is hoped that this will stir up some of our architects to telling us just how successful their business has been.

Captain Alden Waitt of the Chemical Warfare Service sent in a post card recently showing a photograph taken on Wialua Beach, in Oahu of Hawaii. The beach scene shows both Captain Waitt and Major Bill Lucas basking in the sun. Lucas, however, had taken refuge behind the sun umbrella, which Waitt commented on by saying that Bill was eager to keep his schoolgirl complexion. He may be eager to keep his complexion, but the picture shows that he has been anything but successful in keeping his hair. Waitt tries to make us think that the picture was taken on Sunday and that on other days he is busy to beyond sundown climbing mountains and other arduous army work.

Porter Adams is still at his summer home at Thetford, Vt., trying to get his health back. He had a quite serious illness early in the summer, at which time it was necessary to bring him back to Boston by plane. Pat is still gaining slowly. We are all looking forward to the day when he will be back with us again at our regular monthly luncheons. — HAROLD B. RICHMOND, *Secretary*, 30 Swan Road, Winchester, Mass. GEORGE K. PERLEY, *Assistant Secretary*, 21 Vista Way, Port Washington, Long Island, New York.

1915

The last shall be first! Lucius Bigelow, V, closed last year's notes in the July issue with his delightful letter and now he opens this year's first issue in a blaze of glory. Are you all ready? Can you stand it? Lucius is married! The following newspaper clipping describes the event: "Miss Mary L. Cummings, a graduate student at Radcliffe, and the daughter of the Rev. and Mrs. George H. Cummings of Warren, was married at her parents' home on Beacon Street, on Saturday, June 25, to Professor Lucius A. Bigelow of Duke University, Durham, N. C., a native of Boston, a graduate of M. I. T., and the recipient of a Ph.D. from Yale. — The ceremony was performed by the bride's father, assisted by the Rev. Christopher Eliot, minister emeritus of the Bulfinch Place Unitarian Church in Boston. After a summer in Maine, Professor and Mrs. Bigelow will reside at 1001 Lamont Avenue, Durham, N. C."

Congratulations and best wishes for contented happiness to Lucius and Mrs. Bigelow. There are now only a few of us left. If St. Elmo Piza gets married, I give myself up.

The following interesting letter tells of Art Nelson's, VI, progress. Our best wishes for success, Arthur. We'll all be glad to hear more from you. "I am breaking the habit of a lifetime by writing you a letter with news about myself. I believe I have never been known to do the like before in spite of your many importunities.

"As you know, in 1919 when my resignation as an officer in the United States Navy had been accepted, I became and was for about 12 years a partner of Professor Dugald C. Jackson in his engineering firm, where I acted as manager of the Construction Department which handled problems relating to plant investigation, operation, and construction. We had a very interesting engineering practice for a group of public utility and manufacturing companies, among which were the Boston Elevated Railway Company, the Boston Edison Company, Fall River Electric Light Company, the Owens-Illinois Glass Company, the New York Air Brake Company, and others. I spent a very interesting and not unprofitable 12 years at this work.

"A short time ago Professor Jackson definitely retired from the firm. Since then the old firm has split up, and I have been carrying on my work for the people I have been serving under my own name. I have taken into my firm as partners two of the men who have worked with me for a good many years; namely, Edward H. Cameron '13 and Myron F. Freeman '24. Both of these men have become outstanding engineers in their particular lines and have handled important engineering projects in New England and also in the West and in the South. Our personnel consists of men who have been with me on my work for many years.

"Our home office is still in the Park Square Building in Boston. The volume of work we are doing, of course, is materially less than it was during boom times. We have a reasonable amount of business, however, and manage to pay our bills and get along fairly comfortably.

"To give a complete account of myself to my classmates who have not seen as much of me as you have, I am married and have three children — a boy ten, a girl seven, and a boy two, who are now spending the summer on Buzzards Bay on Cape Cod.

"To the collection of bad habits which I had upon graduation from the Institute, I have added rowing in a single from the Union Boat Club, and playing squash at

1915 Continued

the University Club. Challenges from squash players will be cheerfully received at any time; the worse the player, the more cheerfully will the challenge be received." — AZEL W. MACK, *Secretary*, 379 Marlboro Street, Boston, Mass.

1916

Jeff Gfroerer has finally returned from Germany and is living in Taunton temporarily. Jeff has the United States manufacturing rights for a new process in preparing wheat for the manufacture of bread. The process is very valuable as the vitamins are not removed, making the bread more nutritive than ordinary white flour.

I had the pleasure of entertaining Jeff and his wife at dinner recently and certainly enjoyed hearing of their various experiences while in Germany. At present he is taking a month's vacation down at Matapoisett, Buzzards Bay. — Ed Weissbach has returned to 1325 Yarmouth Avenue, Cincinnati, Ohio. He sends his usual newsy letter: "It hardly seems possible that just a year ago we ended our Fifteenth Reunion, amid a feeling that the bottom of the depression had been reached and that by the first of September business would again be on the up grade.

"When May came we decided to store our furniture and come back to Ohio to see what things were like out here and perhaps get a job in the Middle West. But they are not better here than in Philadelphia. But we can double up with relatives, a thing impossible for us when in New Jersey.

"On our trip to Ohio, we thought it would be a good plan to have our six-year-old girl see something of Washington and Mt. Vernon. We had plenty of time on our hands so that the next move was to take in the Shenandoah Valley during the Apple Blossom Festival. What a wonderful farming country it was too. Down through New Market and Staunton to Lexington. We stayed at a delightful little country inn just below L. with the idea of seeing Natural Bridge, Va., the next morning. The bridge is well worth a visit. As we had the ciné-kodak along, we managed to get some first-class movies of it. Returning to Lexington, we started west over US60. I think that this one is infinitely more enjoyable than routes 30–40–50. It has been written up in one of the magazines recently. That night we had finished the mountains and stayed at Charleston, W. Va. No long trip is possible with a six-year old child, at least we have never found it so. Let's hope that when the Twentieth Reunion swings around we will all be out of the woods. The way it looks to me it's going to take five years to straighten things out."

I am sorry to report the death of two classmates: Donald O. Dunn at Cleveland, on June 17, and David L. Jacobson, of Pittsburgh, on March 6, 1932.—HENRY B. SHEPARD, *Secretary*, 269 Highland Street, West Newton, Mass. CHARLES W. LOOMIS, *Assistant Secretary*, Care of Bemis Bro. Bag Company, Memphis, Tenn.

1917

The Class Reunion at the Corinthian Yacht Club, Marblehead, in June was a real success in spite of the limited attendance. At the last minute, our dear Treasurer, Augustus P. Dunham, was unable to appear. We understand because somebody ordered an extra dozen bars of chocolate and Brick had to spend Saturday afternoon making them up with the help of the chief executives of the company who were visiting him from New York. — H. N. Keene made a very excellent pinch hitter and actually brought the ceremonies to a conclusion without having a deficit.

Most of the honors were gathered by one Chambers Mehaffey, he taking either temporary or permanent possession of all the cups that were awarded including the Dunning distance cup previously awarded to Tourtellotte, Senter, and Hegenberger.

We had previously supposed that certain fixtures were necessary to a fully successful gathering, but the facts are that the Reunion was most enjoyable in spite of the absence of good old Jimmy Doon, Prestidigitator and Politician Dudley Edwards Bell, our aforesaid Treasurer, Ted Bernard, and even Leon McGrady. In Mac's absence, Bill Eddy did most of the honors including the introductions of Dr. Compton and Dr. Bush, who spoke at the luncheon at Walker Memorial preceding the trip to Marblehead. By general agreement of those present, it was decided that a similar meeting should be held at the Corinthian or at some other suitable place once each year, preferably at about the same time. There is, therefore, no reason why you should not make plans well in advance for the Annual Reunion program, these annual affairs to be supplemented by the usual five-year meetings when special effort should be made to attend, particularly by those from a distance.

Among those attending this year's Reunion were the following: Messrs. Gilmour, Blanchard, Hill, Ross, Proctor, Littlefield, Marlow, Lovejoy, Lobdell, Holt, Thompson, Maeder, Wood, Doherty, Anderson, Keene, Eddy, Whitney, Mehaffey, Bell, Stevens, Sawyer, Crosby, Auty, Chisholm, and Pollard. — RAYMOND STEVENS, *Secretary*, 30 Charles River Road, Cambridge, Mass.

1918

From Wood's Lane Cottage, Blue Hill, Maine, comes an anonymous communication memorializing me for referring in the July issue to Saint Peter's Cathedral in Rome. The correct name, so I am informed, is The Basilica of Saint Peter. The cathedral of Rome is St. John Lateran. We appreciate not only the correction but the interest which a graduate of several decades ago takes in reading our chronicle.

From the very pinnacle of the Aloha Tower, Honolulu, Frederick B. Philbrick postcards: "I just closed a fire alarm and police signalling contract for $294,000. Returning Los Angeles soon and will write you a real letter. Go thou and do likewise."

From the post office of Wellsburg, W. Va., Gretchen postcards: "Four hundred and sixty-five miles, New York City to Wellsburg in 12 hours driving time in Sunday traffic in my new Chevrolet. What do you think of that?" Answer: she should be sending postcards from the court house on Monday.

From the Hotel Frederick, Endicott, N. Y., Lawrence J. Allen writes: "I am now in the sales department of the International Business Machines Corporation, 270 Broadway, N. Y., and am attending their sales school at the main factory. You may know that Chink Chamberlain is also with the Company. How's everything?"

Somewhat more detailed is Arthur Windle's epistle from Highmount Avenue, Nyack, N. Y.: "Because I think that such letters as I received from you should be sent out annually instead of once in 14 years, and because I like to read what the other fellows are doing, I shall proceed to identify myself. Since the first of February I have been the 'new Superintendent' at the plant at the Metropolitan Sewing Machine Corporation at Nyack. The company makes some 600 different species of sewing machines, not including the well-known Devil's darning needle. Our product is manufactured mostly for industrial purposes (when there is any industry). While waiting for this job to turn up I went to your office at Technology one day, but you were not in and I left a note, concluding that you were swapping fish stories or golf scores, or whatever variety of contract you play, with some other busy professor. (Note: your scribe does not go fishing, does not play golf, and does not understand the mysteries of cards. Life is too short.)

"I understand that Kayser is managing a laundry somewhere, I don't know where, but suggest the Cannibal Islands. H. L. Miller is at 28 Concord Street, Holliston. About two months ago I saw Hamilton in the Technology Club Rooms in New York. I am still married, change the spark plugs in the Buick every 10,000 miles, ride on Goodyear tires, see my dentist twice a year, and don't inhale. Please write again before you need any money for our Twenty-Fifth Reunion and do tell us something about yourself."

Well, if you must know: "Behemoth; the Story of Power," by Hodgins and Magoun, was an April book club selection and is on the Chicago *Journal of Commerce* list of the best 100 books of the year. While finishing my seventh book in the woods of Connecticut last summer, I made a collection of over 100 specimens of moths and butterflies, which now adorns my office wall. For more complete particulars see the 1932–1933 edition of "Who's Who."

Paul Pickering Wrigley was married last May in New Rochelle, N. Y., to Miss Georgiana Marjorie Yonge of Devonshire, England, and Madras, India. Further details have not reached your scribe as yet. — Last August Donald G.

1918 Continued

Merrill and family motored over from Hartford to our summer place in Union, Conn. Young David, M. I. T. '50, demonstrated his engineering ability by identifying a hammer, screw driver, wrench, and so on, but disqualified for the course in Naval Architecture by calling a motor boat a "schooner." Don is with the Hartford Empire Company, manufacturing glassware by the carload lot for the Woolworth Stores and so on.

It is with regret that we announce the death of James Lomax Clark at Lake Sunapee on August 12. — F. ALEXANDER MAGOUN, *Secretary*, Room 1-305, M. I. T., Cambridge, Mass. GRETCHEN A. PALMER, *Assistant Secretary*, The Thomas School, Wilson Road, Rowayton, Conn.

1920

The only fellows I have seen are Frank Maconi, who is still in the investment business in Boston; Jim Gibson, who is still in the real estate business in Newton and who acquired a bouncing boy this summer to make a nice family of two boys and one girl; Buck Clark, who is still in the investment business in Hartford and who with your secretary went out and collected a tidy sum of money on the golf links from Gibson and Perk Bugbee early this summer; Ed Murdough, who is still manager of Cities Service, Portland District, and who reads about this thing they call the "Depression" in the newspapers and doesn't believe in it; and Perk Bugbee whose daughter Margery is now more than half a year old and who with his two fine boys makes a family to compete with the Gibsons.

Way back last May but after the notes for the last Review had gone to press, I received the news that Jimmie Moir had become engaged to Miss Marion Winsor Freethy of Waban. The Class congratulates you, Jimmie.

Raymond B. Collerd is now located at 3538 Scott St., San Francisco. — Eric Etherington has left Utica and is now with Bonbright & Co. in Chicago. — Henry Forrest is living in Hastings, N. J., address 1326 Hastings St. — Leo Kahn is living at 70 Chiswick Road, Brighton, Mass.—Stan Bragdon has left Milwaukee and now resides in Westbrook, Maine. — HAROLD BUGBEE, *Secretary*, 7 Dartmouth Street, Winchester, Mass.

1921

Three new entries in our Class record of vital statistics claim the spotlight in the news which ushers in this new Volume of The Review. Two of these new members of the 1921 family will be candidates for the Class of 1953 at the Institute, while the third has announced her intention of wearing the same numerals at Wellesley.

Through Professor Locke we hear that Mr. and Mrs. Ernest R. Gordon are rejoicing over the birth on May 10 of a baby boy. The new arrival has a sister about five years old. At last reports, Ernie was in Guanajuato, Mexico, in charge of the San Nicolas del Monte mine of the Amparo Mining Company.

Ray writes that Saul M. Silverstein, Technical Director, Rogers Paper Manufacturing Company, South Manchester, Conn., is the proud father of a second addition to his family, namely a girl, Phyllis Ann, born on August 8, weight 8 pounds and 14 ounces. Saul has a husky boy, Lee Marvin, who is 27 months old.

Your Assistant Secretary and his better nine-eighths wish to report the arrival of Alfred Louis Clarke, weight 8 pounds, on August 9. Mrs. Clarke and the baby are both doing well. They have just arrived home as we assemble these notes and the typewriter does not seem to be standing up under the excitement. We thank the Review Editors in anticipation of the ultimate correctness of the spelling, grammar, and punctuation herein!

From the Boston *Herald* we learn of the marriage of Miss Katherine Frances Burke, daughter of Mr. and Mrs. Richard G. Burke of Arlington, to Mr. Harry B. White, son of Mrs. Frederick O. White, also of Arlington, on August 20 in St. Agnes Church. Miss Burke is a member of the Proparvolus Club. Mr. White is an attorney with the Maryland Casualty Company of 40 Broad Street, Boston.

Also from the Boston *Herald:* "Warren K. Brimblecom, managing editor of the Newton *Graphic*, has announced his candidacy for the House of Representatives from the 4th Middlesex district. He is a graduate of Newton High School and Technology and lives at 5 Fairfield Street, Newtonville. He is a member of the Newton Republican City Committee."

A recent note from Maxwell K. Burckett gives his new address as 214 Laurel Avenue, Arlington, N. J.

We were glad to have Edwin R. Clark drop in for a visit during one of his recent trips to New York. Ed is with the Lynn Gas and Electric Company and lives at 77 Magnolia Road, Swampscott. As reported in these columns, he has a fine daughter, now almost ten months old, and our luncheon discussion developed more along those lines peculiar to fond fathers rather than on matters technological. Ed did tell us that he had heard that Sanford Hill had been in a Wilmington hospital as a result of an accident. Does anybody have any further details?

G. Everett Farmer, a member of the Californiac Division of the Class, receives our hearty thanks for his annual long and newsy letter. Gef is now with the Metropolitan Water District of Southern California and is at present laying out a $500,000 communication system for the construction of the aqueduct to the Colorado River. He is the author of an article in a recent issue of *Electrical World* entitled "Miniature Control of Substations," which describes the use of telephone equipment in the construction of several remote control power switchboards. Gef says he often sees E. R. Chilcott, who is with the Los Angeles office of Electrical Research Products, Inc. He also requests that his regards be forwarded to the Kurths and the Hatheways. We fully reciprocate the good wishes from all at 132 North Carson Road, Beverly Hills, Calif.

Henry M. Lane presented a paper on "A Resistance-Capacitance Coupled Amplifier in Television" which appeared in the April, 1932, issue of the *Proceedings* of the Institute of Radio Engineers. Since graduation, Hank spent two years as an engineer in the Hammond Research Laboratory following which he was an instructor in Electrical Engineering at the Institute for eight years. From 1924 to date he has been Radio Technical Editor of the Boston *Post*. If old 1AB will heed our appeals for bigger and better news and write us a letter in the genuine Farmer style, we will tell you more about him in these columns later on.

S. Paul Johnston, Assistant Editor of *Aviation*, 330 West 42nd St., New York City, also receives our thanks for his fine letter bringing our records up to date. In part Paul says, "I spent the first eight years after leaving school with the Aluminum Company of America, including three years as assistant superintendent of the plant at Massena, N. Y. I left the company at the end of 1929 to collaborate with E. P. Warner '17 in the preparation of *Aviation Handbook*, which was published by the McGraw-Hill Book Company in December, 1931.

"Since January, 1931, I have been assistant editor of *Aviation Magazine*, of which Mr. Warner is editor. I look after most of the technical material on airplanes and engines and, during the past year, have been making a specialized study of maintenance on the major airlines.

"In 1923 I was married to Miss Carol Rhodes of Buffalo, N. Y. We have a daughter aged seven and a son aged five and are now living at 847 Shadowlawn Drive, Westfield, N. J."

Electric Refrigeration News for July 29 contains an article relating to the sales activities of Peirce-Phelps, Inc., Majestic distributor in Philadelphia, located in the Peirce-Phelps Building, Fifth and Noble Streets. J. Trevor Peirce is President of the organization and C. M. Phelps '24 is Secretary-Treasurer.

Jackson W. Kendall is another annual letter-writer (also of the Californiac Division) who helps to make this secretarial work worth the effort. Jack is now Vice-President and Manager of the Crown Transfer and Storage Co., Broadway at Green St., Pasadena, Calif., as well as organizer and President of Yellow Vans, Associated, a group of 20 associated warehouses on the Coast patterned after the plan used by the Yellow Cab Company. Jack says: "No doubt by this time you have seen Stuart Nixon, who has returned to New York after a year in California representing the Continental Motors Company. Stuie is now representing them on the East Coast and is located at the Fraternity Clubs, 22 East 38th Street. Have seen considerable of Sam Lundeen recently. He is becoming quite a prominent architect and is now doing the new library of the University of Southern California.

"Sorry I didn't get a chance to see you when I was East in January. Met a chap by the name of William J. Schaefer '22 of

1921 Continued

Stamford, Conn., and so far as we could determine we are the only two Technology men who have degenerated to the warehouse industry." The *Furniture Warehouseman* for April, 1932, under the heading of "One of the Younger Executives," contains an interesting account of Jack's rise to stardom. — RAYMOND A. ST. LAURENT, *Secretary*, Rogers Paper Manufacturing Company, South Manchester, Conn. CAROLE A. CLARKE, *Assistant Secretary*, Dunbar Street, Chatham, N. J.

1923

The summer months always permit the accumulation of a considerable number of items. Jim Robbins, I, became the papa on August 14 of a daughter, Ann Lovejoy. William S. Clarkson, II, who is with the Standard Oil Company of New York, was reported by the New York *Times* last April to be engaged to Miss Marjorie Hatt of Albany. Their wedding was scheduled for June.

Dr. E. D. Ries, X, who is now with the du Pont Company's experimental station at Wilmington, gives the following account of himself: "My relation to the Class of '23 is a little out of the ordinary in that I came to Tech as a graduate student in '21, leaving in '22 and taking my degree *in absentia* in '23. I returned in '24 and got my doctor's in '26. Consequently, it is hard for me to know just what class I really belong to. A short sketch of my doings since '22 is as follows. From '22 to '24 I worked for Standard Oil at Elizabeth, N. J. Also during this time I changed my course of living considerably by getting married. In the spring of '24 I gave up my job and returned to Tech. After serving my second sentence, I went to Penn State where I taught chemical engineering for four years. I left there to go with the du Pont Company at their plant at Belle, W. Va., where I have been until the transfer which just occurred. I am working here with the same department of the Company but along a little different line. I have two small daughters who take up what spare time I have and who help me to avoid what threatens to become a 'bay window' of rather immodest proportions."

Erling Skabo, XV, reports: "After graduating, I worked for the Baldwin Locomotive Works for six months as a laborer. Thereafter I was with the General Electric Company at Schenectady in their Credit Department for eight months, as a salesman in the Bronx for the Ruud Manufacturing Company for six months. I then left for Germany and was there for three months with the Western Electric Company and later with them in Oslo for eight months and in Brussells for six months. I then established my own firm in Oslo which I worked with varying success dealing mainly in radio until I became connected with A/S Elektrisk Bureau in Oslo as leader of the radio division. A/S Elektrisk Bureau is a L. M. Ericsson firm, part of the second biggest telephone combination in the world. I have been here two years now, at a fair salary and excellent working conditions. I shall probably remain here for a good many years if unforeseen circumstances should not develop."

The Boston *Transcript* records the wedding of Hawley Young, II, and Edith Akerley of Somerville on June 27. Among the ushers were Ted Norton '26, Roger Cutting '24, and Harold Akerley '27. The bride is a graduate of Portia Law School. The clipping says the couple are to be at home at 92 Powder House Boulevard, West Somerville, after July 18.

I heard recently from Hugh Chase, I, who wrote from Winnemucca, Nev.: "I finally wound up my second school days at Tech with a S.M. in geology in June after a year's extensive work. Fortunately for me, one of the boys of Course I '30 who has been at the University of Maine is coming back to the Institute for further studies. I put in for his position and received the appointment. I am to teach several courses in geology and one in surveying. Just at present I am sojourning in the wild and woolly west for a vacation and acquiring knowledge of the geology out here. I am located in a small town but the only one of any size in Humboldt Co., Nev., and am visiting mines, romping over the hills, and taking pictures when not listening to the tales of the ever-present prospector."

I. W. Alcorn, III, who is Secretary-Treasurer of the Mid-Continent Section, A.I.M.E., is now sales engineer, covering sub-surface equipment, with the Oil Well Supply Company of Tulsa. A son, John Stewart Alcorn, was born on February 29; and accordingly will have to wait four years for his first birthday anniversary.

Frank P. Knight, Jr., III, who is Manager of the Oxford Mining & Milling Company at West Paris, Maine, gave a very interesting talk on the feldspar industry at the April meeting of the Boston section of the American Institute of Mining and Metallurgical Engineers. This talk appeared in the *Journal* of the Engineering Societies of Boston, June 1932.

Clark C. Miller, X, was married to Rhoda Joan Hornish at Washington, Ill., on July 2. They are at home at 150 South Tenth Street, Wood River, Ill.

Dr. Malhotra Des Raj, X, is with the Bombay-Baroda Central India Railway at Ajmer, to which he has moved from Lyallpur. Harry Raphael, XV, is with the Retail Dry Goods Association in New York. Samuel S. Burgey of the Army Ordnance Department at the Watertown Arsenal has been promoted from Lieutenant to Captain.

Those members of the class who are in the military services shift around periodically. Captain Fred I. Gilbert, II, and Lieutenant Wallace R. Dowd, XIII-A, are now at San Francisco and Major Philip G. Blackmore, II, and Captain John Huling, Jr., II, are at Fort Benning, Ga.

I have asked those sending in address changes to write in and let us have the why and wherefore, and this can serve as a reminder in case they've not already written by the time these notes appear.

Please note your secretary's change of address. The change from Cambridge to Braintree is prompted principally by the fact that it will put me that much nearer to the Cape to which I go pretty regularly on week-ends. — HORATIO L. BOND, *Secretary*, 195 Elm Street, Braintree, Mass. JAMES A. PENNYPACKER, *Assistant Secretary*, Room 661, Eleven Broadway, New York, N. Y.

1926

Mustached members of the Class, because of their retiring nature, do not often send communications to this department. I was, therefore, agreeably surprised this summer when a letter appeared from Whitney (Lounger) Ashbridge. As an interlude in the selling of life insurance in Philadelphia, he was attending a course for National Guard and Reserve officers at the Engineers School, Fort Humphreys, Va. The Army, it seems, has replaced *The Tech* as a driving force in Whitney's life, for like *The Tech*, it always inspires him to literary effort. He mentioned having seen Allston Calhoun in Washington, Dick Pough in Philadelphia, and Ed Wyane in some place he studiedly or accidentally left unmentioned.

Chippy Chase, while not customarily a wearer of mustaches, really belongs in that class because of his infrequent communications. A new and better job, however, set him off recently, and he wrote in some detail of his experiences as a big bathing-suit and sweater man in Manchester, N. H. Chippy's enthusiasm for this new work oozes from every page of the letter. "Why did I ever study chemistry?" he asked rhetorically. "Surveying would have been more use in trying to fit fat women." Chippy, it will be recalled, has made a triple play — from chemistry to banking to manufacturing bathing suits. The name of the firm he is with is the New Hampshire Mills. Evidently Chippy and his family find Manchester most congenial.

On a barn-storming trip to the West Coast this summer, I encountered several members of the Class in various provinces of the country. In Anaconda, along with several others, Bill Wraith was kind enough to try to explain the mysteries of copper smelting to Dean Lobdell and me. In Seattle, I saw Bill Mattson, who is road master for the Northern Pacific, his section being "on the mountain" east of Tacoma. It was through his machinations that I received permission to ride in the cab of one of his railroad's passenger locomotives. In Los Angeles, Charles Francis Jenkins, Jr., was present at the Technology Club meeting there and I saw him subsequently, dining at the Mission Inn, Riverside. In Denver, B. V. Howe, State Sanitary Engineer, was present at a Technology Club meeting. In fact, he is Secretary of the club there.

I left Los Angeles for the East two days before the opening of the Olympics and thereby showed, what was to Californians, an incomprehensible disregard of international amity and California sunshine. Before leaving, however, I looked up Joe Levis and found him residing in

1926 Continued

Olympic village. He was practicing there under the paternal eye of Sam Cole, who was helping manage the American Fencing Team. Sam must have done a swell job, for Joe took second place in the individual foils competition, thereby giving the United States the highest honor it has ever been able to win in an Olympic fencing competition. Some time previous to the Olympics, Sam had succumbed to the allurements of California and had moved his family there. Joe, after having been publicly kissed before a large crowd during the fencing competition, blamed the incident on the California climate and fled in confusion back to Boston.

Early this summer Edward N. (Bull) Roberts called by the office. He is back from Chile and his headquarters are now 66 Edgewood Avenue, Yonkers, N. Y.

And now after the pleasant charivari given above, I turn to more sober and notable matters. At Milton, Mass., Saturday August 13, Eben Haskell was married to Miss Marion Moore Raymond. — On the 31st of May, in New Orleans, Hoyt Sherman Baker married Miss Frances Barrus Hirn. — On June 4, William M. Walworth was married in Maplewood to Miss Catherine Neff.

At the risk of announcing an engagement after a marriage has been performed, I note an even earlier item culled from our clipping service. On May 14, the engagement of Dorothea Jones of Brighton to Henry F. King was announced. — J. RHYNE KILLIAN, JR., *General Secretary*, Room 11-203, M. I. T., Cambridge, Mass.

COURSE VI-A

About a month ago on calling Frank Grueter, we had lunch together. He is the same prosperous looking Frank, still single from all appearances, with his love at present being his work for the N.E.L.A. and his hobby in the Army Reserve. He is taking his commission in the Coast Artillery very seriously and is enjoying immensely the contacts and work it brings him. Part of his duties is to teach unsuspecting student officers technical subjects relative to gun firing, and so on. Frank says he quite enjoyed himself the first time he endeavored to teach them a subject he knew very little about. Says he believes he learned more than they did. Please don't misunderstand me in that Frank failed to teach these boys anything, for I am sure he did. He learned, however, that the best way to learn a subject is to teach it.

A couple of weeks ago I had the good pleasure to be in Philadelphia and Washington and, of course, I called up Jim Crawford and Ralph Hanner. Jim is still with the Bell System in Philadelphia and has quite a bit to do about figuring how many pairs of wires are required in a cable so that the required number of old ladies can gossip contentedly together by the half hour over the phone. Occasionally, he says, he has the honor of proving that when a map shows that a cable connects two points and is laid in a certain place, it is really there and that radio or a ground connection between the two points is not in use. Jim is quite content to catch the 5:15, or whatever one it is, and travel a few miles to his home where Mrs. Crawford is waiting for him. (It seems to be an old Benedict custom.) They were preparing to move shortly and Mrs. Crawford was having the joy of the details and arrangements of their new home.

Ralph dropped over to see me when I called him up and we had a delightful half hour of talk, past, present, and future. He is with the General Electric Company in their Patent Department in Washington. At present he is winding up his studies of law to take his bar exams shortly. We who know Ralph know that he doesn't have to worry as to whether he will pass them. — It seems that George Taplan is also in Washington, although I did not have the pleasure of seeing him. He is in the Government Patent Bureau and is also studying for the bar. Here's success to both of you boys in your coming exams. Ralph, as you know, is married and is the proud daddy of Benjamin Vail, age six months. If my stay in Washington had been longer, I should have liked to have seen the rascal.

As for myself, there were two outstanding events of the past year, one pleasant and one not. Last fall we were in an automobile accident which caused facial cuts to my eldest girl, now about 29 months. Otherwise, we miraculously got out of a very nasty situation. The other event was the birth of my young Nancy Ann on December 30, so that now my joys and troubles are twofold.

This depression seems to have taken its toll right and left, but as far as I know most of our boys are still on the pay roll, which, to my mind, is a tribute to our Alma Mater and to our course. We have much to be thankful for. — BENJAMIN P. RICHARDSON, *Secretary*, Box 384, Congers, N. Y.

1928

For nearly three months the only news which has come to the attention of Ye Secretary is announcements of engagements, marriages, and births. Such announcements, however, augur well for the success of '28 through the depression months. To one and all of the men whose engagements and marriages are noted below, the Class extends its heartiest best wishes and congratulations.

To Ames Hettrick, the old maestro of *Voo Doo*, goes the honor of starting the "wedding intentions" column. His engagement was announced on June 7 to Miss Frances Caryl O'Brian of Washington, D. C., the daughter of the Assistant Attorney-General and Mrs. John Lord O'Brian. Ames is now located in Amherst, Va.

On June 25 Jack Chamberlain's engagement was announced to Miss Eleanor Lucy Bowker, the daughter of Mr. and Mrs. Everett M. Bowker of Brookline. Jack's fiancée is a graduate of Miss Wheelock's School and is now a member of the faculty of the Cabot School in Brookline. Last June Jack graduated from the Harvard Medical School.

Course XV leads in the number of marriages since our last notes were published. On July 23 Art Smith was married in Defiance, Ohio, to Miss Dorothy Frances Vandenbroek, daughter of Mr. and Mrs. John C. Vandenbroek of that city. Art's wife is a graduate of Lake Erie College at Painesville, Ohio.

Al Richmond also joined the ever increasing ranks of '28 benedicts on June 30 in Southbridge, Mass. His wife is the former Miss Helen M. Grant, the daughter of Mr. and Mrs. George Grant of that city. Al is the secretary of the Merchants and Manufacturers Association of Southbridge.

In Joe Guertin's marriage, Course I steps into the marriage column. Joe was married on May 28 to Helen Anne Donovan of Medford, Mass., the daughter of Mr. and Mrs. Timothy J. Donovan. Joe is now living at 103 Hollis Avenue, Norfolk Downs, and is working on the new Rindge Tech building in Cambridge. — From Norfolk, Va., comes the news of Jim Fahey's marriage to Hazel Elizabeth James, daughter of Mr. and Mrs. Earley Washington James. — New Hope, Pa., was the scene of Don Fraser's marriage to Martha Evelyn Plank, daughter of Mrs. Edith Plank. Don was married on Saturday, the sixteenth of April.

Chuck Sampson, II, was married on Friday, June 17, to Sigrid Caroline McNeilly in Newton. Chuck is now located in Rochester, N. Y.

Course IV-A breaks into the limelight in Slim Maeser's marriage to Alice Lavinia McNeilly on Saturday, June 25. Slim is an instructor in the Testing Materials Laboratory and is making his new home at 420 Memorial Drive.

From Honolulu comes the news that Dud Smith, XV, is the father of a son, Richard Case Smith, born on August 3. Dud's wife is a sister to Chris Case, XV.

René Simard, X, has returned from Europe, where he studied in Berlin and Prague, to his home in Montreal. René obtained his Doctor's degree in Natural Sciences at Charles University in Prague, Czechoslovakia, the oldest existing German university. Congratulations, René! — GEORGE I. CHATFIELD, *General Secretary*, 420 Memorial Drive, Cambridge, Mass.

1930

COURSE VI-A

Superficially it would appear that prosperity was returning for some of our classmates. I have just learned that Frank Burley has acquired a new 1929 Ford. Bill Wannamaker, living in the same vicinity (Camden, N. J.), also has a car that runs. I hope we shall all see more of Frank and his wife and Wanny now that the transportation problem has been simplified.

I have finally received a very welcome letter from George Schaible, who is taking a student training course in outside plant construction with the New York Telephone Company in Albany, N. Y. He is happily settling down in married life with but one worry, and that

1930 Continued

is that he cannot yet climb poles without the line gang feeling that it has to advise him as to how to hold his body and his various limbs. George had his vacation in April and spent the time touring the Carolinas with his wife.

It is rumored that G. I. F. Theriault is working for WNAC in Boston. Let's have the lowdown, Terry. — Bill Spahr is at present working for the Metropolitan Life Insurance Company, but not as an agent. — I understand that Hermon Scott and Myron Smith are with the General Radio Company in Cambridge. — Jarvis Moore Bub Wilson is still exercising "Cathie," his pet car, in Buffalo, where he is engaged in repair and installation work as part of a training course with the New York Telephone Company.

I. M. Dow is working in manual system development at the Bell Telephone Laboratories. — The last I heard of them, Carl Ellsworth and W. T. Noyes were living together in Cambridge. Carl, believe it or not, is a lab. instructor at M. I. T. and Bud Noyes is with Barss, Knobel & Young, Inc., indulging in research in electronics. — I was glad to hear from Prendy, when I visited him in Westfield not long ago, that Ray Bowley's father was coming along nicely after a very serious operation. — I have heard the inevitable call of the Oranges and it has enticed me to East Orange from which place I now commute to New York City on the newly-electrified D. L. & W. — EARL E. FERGUSON, *Secretary*, 60 Eaton Place, East Orange, N. J.

1931

While Jim Fisk idles away his time in Europe and points East, yours truly will bear the burden of keeping the Class in the limelight.

Having just passed through the spring and summer when resistance is low anyway, we have a number of marriages and engagements. Our old friend Dick Baltzer has taken unto himself a bride and she is none other than Helen Sweetzer. The great event took place early in June. The Baltzers, as they will be hereafter known, are living in Quincy, where Dick is employed. — Pete Collado deserted the bachelor ranks, also in June, when he was married to Miss Janet Gilbert of Cambridge. The wedding took place in Cambridge, where they are now living. Mrs. Collado was graduated from Radcliffe with the Class of 1930. Pete is still with the Murray Press.

Myrle Perkins, once of the New Hampshire Perkinses, but not of Medford, is also treading the straight and narrow. The young lady was Miss Frances Irene Leatherwood, a graduate of the Sargent School and of the Walter Reed Hospital in Washington, where Myrle is connected with the Union Paste Company.

Howard Huntress was married to Miss Eleanor Leslie Murray of Newtonville. Your correspondent regrets that he knows nothing more about the Huntresses. — Again the spell of June finds its way as Johnny Langmaid joined the ranks of benedicts when he and Miss Dorothea Dare were married. Mrs. Langmaid is a graduate of the Buckingham School and is a member of the Junior League. — Mr. and Mrs. Henry D. Knox have announced the marriage of their daughter Priscilla to Lou Morse. The wedding was on August 6 at Knox Knoll, East Aurora, N. Y. Lou has just returned from Turkey, where he represented Technology at Roberts College.

Phil Bourne was married to Miss Mary Elliot Nicholson of New York and Newport, and June again was the month. Mrs. Bourne attended Mrs. Chapin's school and is a member of the Junior League. And so that's the story of the boys who have definitely fallen by the wayside. Madison Cannon is, however, faltering, as his engagement to Miss Rosamond Cornell shows. Mal, incidentally, is on the staff at the Institute.

John Harrison is still startling the natives with his baseball playing. John is doing physical education work in Belmont and is a member of the Paul Revere League. — Bob Baxter and Bryce Spruill still uphold the prestige of Sears, Roebuck; Bob in Syracuse and Bryce in Gary, Ind. — Met Belvin Williston while tripping the light fantastic recently and Belvin seems to be weathering the depression in fine style. He is working in town. — Ran into Glen Goodhand in Rochester recently. Although I only had a minute to talk to him, Glen looked fine and seemed well contented. He is with the Eastman Kodak Company. His old running mate, Fliv Ford, has gone to work for the Prudential Insurance Co. of America in Newark. Horace, as he is also known, has just completed graduate work in the Department of Business and Engineering Education. On his departure from our department, he presented your correspondent with a tankful of fish to adorn his desk. Whether there is any particular significance or not I haven't decided.

New York has claimed some of the boys. Met Harry Kamy while in Washington and he is going to work in New York. Art Lutz is with the National Theatres Supply Company, but maintains he has no aspirations to become a star. Also in the big city is that old investor, Gil of the Pennsylvania Roddys, who is with Chase, Harris, Forbes. The last time I was in New York, I saw an empty seat in the room where all the Vice-Presidents are gathered, who knows but soon we may have a Vice-President in our midst. — Fred Brooks and Ed Fritz are with the Remington Rand outfit. They are doing sales work.

Jerry Cook is still around the Institute. Just now he is analyzing bonds, or blondes, I'm not certain which, for a Boston concern. — Met Link Gifford out in Illinois, where he is working for the Illinois Zinc Company. Link and his wife are doing a little farming on the side (of the river). One of these days we'll be hearing him orate on the problems of the midwestern farmer. — Lou Hesselschwerdt (not responsible for spelling), Jack Lane, John Elting, and myself are among those on the Institute staff. — Jack Smith is with an envelope concern and but for a small amount of traveling, the job is pretty much stationary.—JOHN M. MACBRAYNE, JR., *General Secretary*, Room 1-181, M. I. T., Cambridge, Mass.

1932

Hello fellows! In order to make the task of news-gathering simpler, we have a Secretary for each Course, with whom you will please correspond so that the rest of us will know what is happening to you.

Rolf Eliassen, 225 Orchard Street, Belmont, Mass., is the Secretary for Courses I and XI; Norman O. Paquette, 172 Sandwich Street, East Windsor, Ontario, for Course II; and Henry J. Chapin, 101 Ardmore Avenue, Ardmore, Pa., for Course III. As yet I have not heard from them, but I am sure that they will have a lot to say in the next issue. The Secretary for Course VI, John C. Gibson, 229 Union Street, Bennington, Vt., has not answered my plea for news. Neither have William A. Kirkpatrick, 1255 Commonwealth Avenue, Boston, Course X, nor Eugene F. Lynch, 77 Hampden Street, Indian Orchard, Mass., Course XIV. Course VII has Henry T. Smith, 77 School Street, Braintree, Mass., but nothing has been heard from him yet.

By James writes that he is so up to his neck in work in a training course of the York Ice Machinery Corporation that he must resign the job of Secretary for Course IX. His address is Yorkco Club, York, Pa. He volunteered the information that Wes Van Buren, his thesis partner, is selling Westinghouse Refrigerators and has Nassau County, L. I., as his sole territory in the wholesale field. I will try to have a Secretary for Course IX before the next issue.

John Lawrence writes that he will not slip up again, but that he has been spending his summer on an island off the Maine Coast and had forgotten all about the mainland. He is not sure what he will do this fall, but if the fellows in Course XVI will write him a note, they may send it to his home address, 17 Washington Street, Rutland, Vt. — Jim Harper, Secretary of Course XVII, didn't realize that he would be called on for news so soon. He is still interviewing people with nothing definite in sight. His home address is 828 Cambridge Oval, San Antonio, Texas.

News from five courses follows. I think that the fellows have coöperated real well in their first attempt to keep the Class of 1932 together. Good luck, gang. — CLARENCE M. CHASE, *General Secretary*, Chase D 33, Soldiers Field, Boston, Mass.

COURSE IV

Dick Bennett retired to Plymouth, Mass., after graduation, has done a bit of mountain climbing in his old stamping grounds, the White Mountains, this summer, and is now hibernating in Plymouth. Rather thinks he will take a Master's degree in the fall. — Ham Brown finished in January and has been back in California since, searching for work in the architectural line.

1932 Continued

Rufus Dryer is working on his thesis this summer at Rogers along with Hugh E. Jones. Jones has been alternating between Boston and Marshfield. — Monty Ferar secured work with a Boston architectural firm in June and will return to M. I. T. for his Master's degree in the fall. — Tom Mackesey is home in Lynn, like the rest of us hoping for things to pick up in the fall.

Fred Moss is in Fairhaven this summer and expects to teach in a boy's school this fall. It was not announced at graduation but Fred received very coveted honors at Rogers. He received the A. I. A. medal for highest scholastic work during the five years. He received the Rotch award with a stipend of $200 for the regular student with the highest grades and also was the first recipient of the Alpha Chi Rho Medal of Course IV "given to the student of the graduating class who has done the most for his school during his five years." Good old Freddy! (He just won't write though.)

Maurice O'Brien of Techtonian fame has gone back to Cleveland, where he will enter architectural work. — Jimmie Walker plans now to come back in the fall for his Master's degree. — Joe Valverde is working in Scranton, Pa. He hasn't given us the name of his firm yet.

As for yours truly, I had a job for the summer as Caddie Master in the White Mountains at the Mount Washington Hotel. They kept us busy doing nothing. I plan to sail early in the fall to travel and study in Europe next year on my traveling Fellowship. — ELLIOT L. WHITAKER, *Secretary*, 16 Crest Road, Sharon, Mass.

COURSE V

Ed Blaisdell, Phil Cook, Ed Nealand, Ed Rosenquist, Al Stotz, and possibly Joe Richmond have decided to return to their Alma Mater in quest of further wisdom. Let's hope that jobs are more plentiful when their educational thirst has been quenched than at the present time.

Edelstein certainly wins the Brown Derby for his snaring of an honest-to-goodness job, down South, I believe. Possibly the family will now possess shoes. Mal Davis also crashed through, when assuming professorial dignity, et al., he blossomed forth as a teacher of science in Sharon.

The last your correspondent knew, our friend Dick Rafter was engaged in a cleaning up campaign, persuading weary housewives that the only thing to do was to purchase a vacuum cleaner of him.

The depression seems to have taken its toll among Course V, also. At the last report our violin player-chemist, Murray, Ernie Steele, Bob Hansen, and Carl McKinney were frantically, if unsuccessfully, scouring the universe for positions. Your correspondent has also had a very checkered few months. From magazine selling to Real Silk Hosiery vending was the path he chose. Now he has a white-collar job — renting automobiles for the Hertz U-Dryvit Company. — A. T. WILSON, *Secretary*, 25 Hemenway Street, Boston, Mass.

COURSE VIII

Jack Millman is going to Germany in September to enroll in the Ludwig-Maximillian Universitat to study theoretical physics with Sommerfeld. He received the Malcom Cotton Brown Fellowship, you remember.

Israel Liben is doing research in the spectroscopy laboratory this summer and will do graduate work this year. — Frederick Powers is looking for a teaching job in secondary schools. — Phil Mayo is at his old summer job at the Gamet Inn at Center Harbor, N. H., and expects to come back for graduate work. — Chippy Chase is going to Harvard Business School in the fall.

I understand that John Such is working for the State but in just what capacity I'm not sure. The last I heard, Harry Krutter expected to come back for graduate study. A few others expect to come back also but I haven't heard definitely from them. — As for myself, I've been very lucky. I have had about seven weeks' work at the job I had before entering Technology and have an appointment as Technical Assistant in the second-year Physics Lab under Professor Page next winter. — C. B. BRADLEY, *Secretary*, 228 Pleasant Street, South Weymouth, Mass.

COURSE XIII

Earle Hiscock is working for John G. Hall Co., Boston agents for the North German Lloyd, and rumor has it that it won't be long before he will be sliding down the ways of matrimony. — Gene Worthen is with the Fore River Plant of the Bethlehem Shipbuilding Company for the summer, helping to design the boilers for a destroyer which they are building. It was said that Professor Burtner was greatly amused to find Gene working on weight calculation in connection with this work. Although Gene is undecided as to whether or not to return to the Institute for his Master's, it is not hard to believe that he will be back at the Institute this fall.

Norman Schulze, the last time we heard, was chasing around after a third engineer's license. We hope he caught up with it. — Fraser Casey, according to last reports, was still flying with the Naval Reserves down at Squantum. — George Daniels is contemplating taking over Cliff Hancock's job with Rimer and Company here in Boston after Cliff goes back to school.

It is with great regret that your Secretary reports the death of one of our number, Allan Maguire of Lowell, who graduated as a ship operator. He was killed shortly after graduation in an automobile accident. We all mourn with his family his untimely death.

As for how your Secretary is keeping busy, he is with his father for the summer in the Thomas Leyland Machinery Company, but has hope like the rest of us that the public of this country will finally come to the conclusion that Americans should ship their products in American vessels and thus stimulate an increase of American tonnage in the Merchant Marine of the United States. — F. BINGHAM WALSH, *Secretary*, 8 West Hill Place, Boston, Mass.

COURSE XV

Professor Schell's very encouraging boast this spring (see all Boston papers, week of June 1, 1932) announced that 45% of Course XV's new alumni were facing the prospect of immediate employment — oh happy state! Of that 45%, I can give no further news. Of the remaining 55% I have nothing!

My diligent but late search for information began in a brief review of our sundry thesis subjects. From Roy Haeusler's Human Aptitudes to Del Cannon's U. S. Destroyer Plant at Squantum I mused, but without inspiration. By the way, have you ever read over those thesis titles? Regan and Russell attempted to revolutionize the ice cream industry, became involved in an unfortunate dispute with the lollypop promoters, to say nothing of the Eskimo Pie magnates, gave up the struggle valiantly but willingly, and left behind fairly valuable statistics concerned with relative sizes of the five-cent and ten-cent dippers. Bill Barker's and my only claim to fame is our title, the longest in the list!

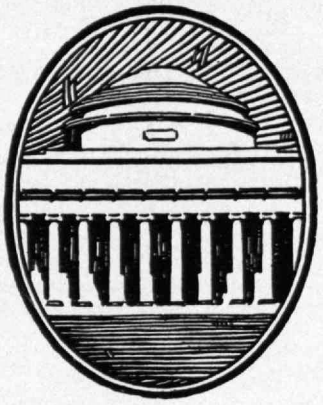
But to get back to this secretarial stuff, I am forced to resort to an assembly of speculative misaccounts, a form of news presentation to which, they say, many of *The Tech* reporters aspire. My conscience is eased somewhat, however, by the fact that most of this batch of '32's letters, as you must have already observed, are based on the same principles.

By the time this epitome has reached the monotyper's hands, Carroll Wilson will have assumed his duties as assistant to President Compton, John A. Finnerty (you remember Finnerty) will have placed himself fairly securely with the First National Stores, Ben Archambault with investment bankers in New York City, Bill Barker (hello Bill) with Firestone, Bud Imray at Harvard Business, George Falk with his dad in the lock and key industry in Leominster, Feibel with his dad in Cincinnati, Newman still collecting pennies in St. Louis, and so it goes.

It's a long cry from Oshkosh, Wisc., where Sears Roebuck has seen fit to send me, to Boston and the Institute, to say nothing of the 60 odd (very odd) men who stepped out into the world this spring with all qualifications for executive positions. As the fall grows older, however, I expect that news of Course XV will reach the upswing of the cycle (an expression I've heard somewhere).

With personal good wishes, and, as they say in 1–190, best of luck to everyone in life's great game! — ADDISON ELLIS, *Secretary*, 83 Washington Boulevard, Oshkosh, Wisc.

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INFORMATION

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Ask for the following circulars by their descriptive letters:

AB: For general information, admission requirements, subjects of instruction, ask for Bulletin AB.

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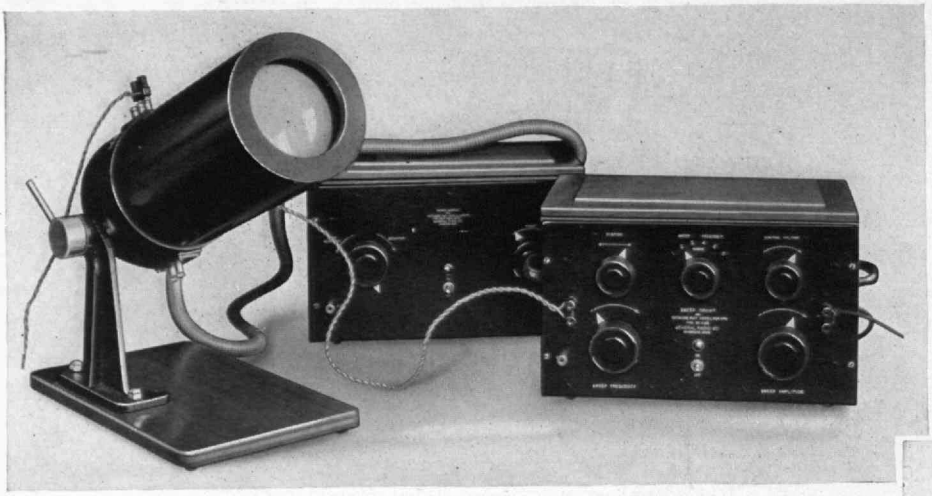
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All inquiries sent to the address below will receive prompt attention

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The General Radio cathode-ray oscillograph and stabilized sweep circuit.

Below . . .
Here's how a B-flat clarinet (left) and C-melody saxophone (right) appear on the oscillograph using the sweep circuit to supply the time axis.

Cathode-Ray Oscillograph

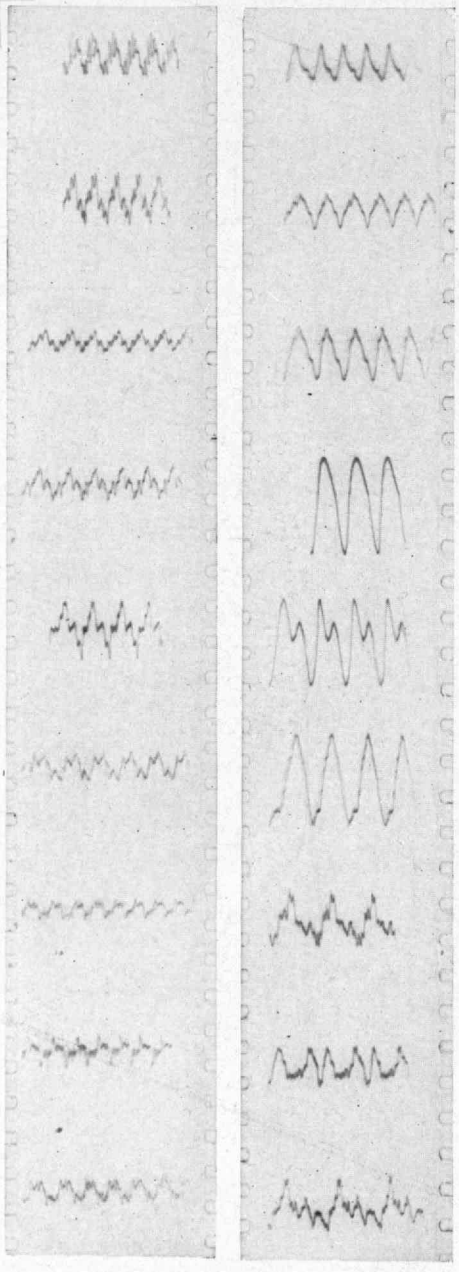
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